OCTOBER 1941 Fifty Cents Per Copy

Coal Age

Volume 46 Number 10

Coal Age again features a machine-minded field in this, its 21st Annual Model Mining Number, devoted to mechanical deep and strip mines in the eastern Ohio No. 8 field. And again it acknowledges its indebtedness to the executives and operating men at these properties, whose unfailing cooperation made this issue possible . . . **Despite** difficult natural conditions, the mechanical-mining pace has accelerated in eastern Ohio in late years, which have witnessed widespread adoption of shaker conveyors in addition to mobile loaders. How both are operated under drawslate and weak top is the subject of articles on pp. 60 and 65. For supplementary face preparation and transportation, see pp. 72 and 77 . . . **Power provisions** for mechanical operation include a number of rectifiers (p. 85), while careful lubrication and inspection feature maintenance (p. 95). Measures

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COAL AGE (with which is consolidated "The Colliery Engineer" and "Mines and Minerals") is published monthly on the 1st. Allow at least ten days for change of address. All communications about subscriptions should be addressed to the Director of Circuation, 330 West 42d Street, New York, N. Y.
Subscription rates: United States, Canada, Mexico, Central and South America, $3 for one year, $4 for two years, $5 for three years. Great Britain and British Possessions, 30 shillings for one year, 60 shillings for three years. All other countries, $5 for one year, $10 for three years. Single copies, 35 cents each. This issue, 50 cents. Entered as second-class matter Oct. 14, 1936, at the Post Office at Albany, N. Y., under the Act of March 3, 1879. Printed in the U. S. A. Cable Address: "McGraw-Hill, N. Y." Member A.B.P. Member A.B.C.

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JAMES H. McGRAW, Founder and Honorary Chairman
Publication Office, 99-129 North Broadway, Albany, N. Y.
Editorial and Executive Offices, 330 West 42d St., New York, N. Y.
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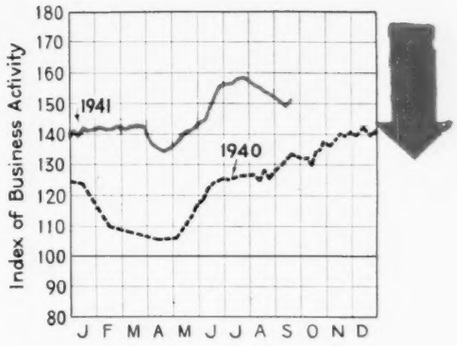
(CONTINUED FROM PAGE 5)

for promoting health and safety include extensive ventilation improvements (p. 81) and comprehensive dust-control programs (p. 101) . . . **Electric strippers** employ the latest shovel and automotive transportation equipment (p. 103), with maintenance and power set-ups to match (p. 106). Except for a different type of power and smaller equipment, methods at small-unit strippings (p. 109) compare favorably with those at the electric operations. A comprehensive program for the reclamation of spoil banks rounds out the stripping picture (p. 114) . . . **Surface preparation** also shows a distinct trend to mechanical methods. Details of plant design to meet modern consumer standdards are the subject of the article on p. 117 . . . **The kitty** for the future contains a wide variety of articles on coal-mining problems, including the third in the series on human relations and personnel building. In it, O. G. Van Campen analyzes the mental, physical, emotional and character factors involved in fitting the man to the job . . . **Finishing a mine** by recovering the barrier pillars with shaker conveyors is the subject of an article by J. T. Federoff, general superintenddent, Pittsburgh Terminal Coal Corporation, scheduled for early publication . . . **And Fred Richart,** of the *Coal Age* staff, soon will begin a series of three articles analyzing power factor and pointing out how it can be improved.

HOW'S BUSINESS

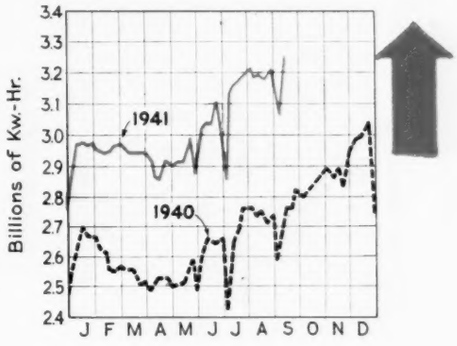
GENERAL BUSINESS CONDITIONS

Reintensification of defense effort has followed the Roosevelt-Churchill conference, with civilian needs getting second call, according to *Business Week* of Sept. 20. Actual volume of business is not likely to be seriously altered, despite curtailment of production of passenger automobiles and other durable goods, as armament output is likely to be boosted. The Index was at 154.8, compared with 152.8 for the preceding week and 157.1 a month previous.



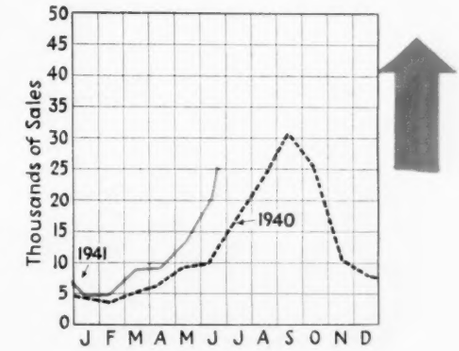
ELECTRICAL POWER OUTPUT

Energy production by the electric light and power industry, according to the Edison Electric Institute, during the week ended Sept. 13 resumed the increasing trend noted before the Labor Day holidays with 3,281,290,000 kw.-hr., an increase of 18.3 per cent over the corresponding week in 1940. Output for other recent weeks was: Aug. 16, 3,201,000,000 kw.-hr.; Aug. 23, 3,193,000,000; Aug. 30, 3,224,000,000; Sept. 6, 3,096,000,000 kw.-hr.



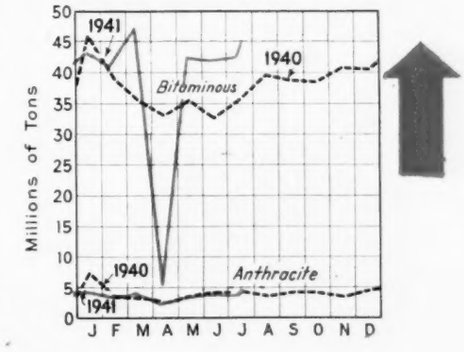
COAL STOKER SALES

Mechanical stoker sales in the United States in July last totaled 26,449 units (U. S. Bureau of the Census from 101 manufacturers), compared with 21,787 in the preceding month and 16,840 in July, 1940. Sales of small units in July last were: Class 1 (under 61 lb. of coal per hour), 24,754 (bituminous, 22,419; anthracite, 2,335); Class 2 (61-100 lb. per hour), 683 (bituminous, 620; anthracite, 63); Class 3 (101-300 lb. per hour), 609.



COAL PRODUCTION

Bituminous coal produced by United States coal mines in August last (preliminary) totaled 45,650,000 net tons according to the Bituminous Coal Division, U. S. Department of the Interior. This compares with 43,300,000 tons in the preceding month and 39,010,000 tons in August, 1940. Anthracite tonnage in August last, according to the U. S. Bureau of Mines (preliminary), was 5,246,000, against 4,681,000 (revised) in the preceding month and 3,883,000 tons in August, 1940.



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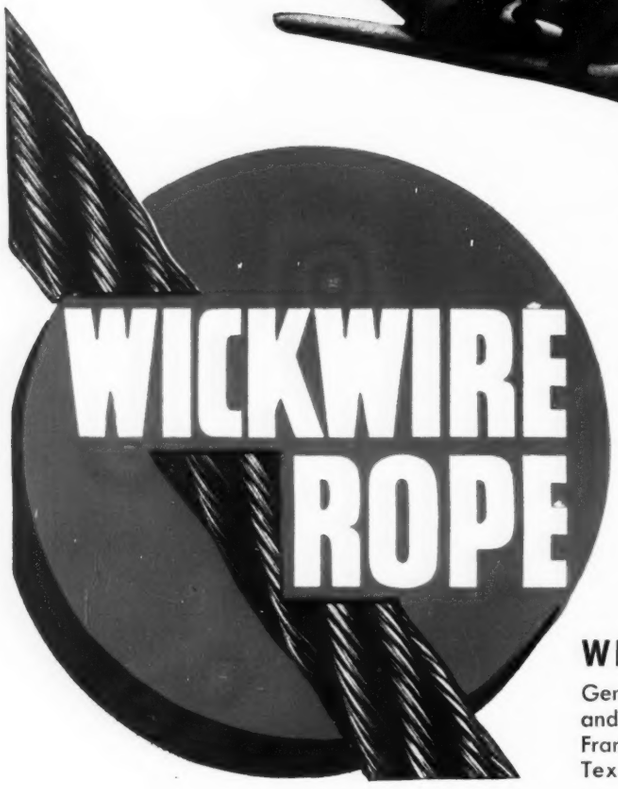

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DEVOTED TO THE OPERATING, TECHNICAL AND BUSINESS PROBLEMS OF THE COAL-MINING INDUSTRY

Coal Age

Established 1911 — McGraw-Hill Publishing Co., Inc.
SYDNEY A. HALE, Editor • OCTOBER, 1941

Ohio No. 8

WHEN a coal field or a group of mines is featured in a Model Mining number such as this, the twenty-first in the *Coal Age* series, a natural question might be "Why?" Although the answer embraces many factors, some are more outstanding than others. One is a willingness on the part of management to face the hard fact that progress and profits depend upon modernization and mechanization both above and below ground. Another is a keen desire for the elimination of all possible hazards to life and limb. These are reflected in a third major consideration: adoption of modern equipment and methods for mining, loading, transportation, power supply, ventilation and drainage, maintenance, preparation and safety.

MEASURED by these standards, the mechanical mines in the No. 8 seam of eastern Ohio take a well-deserved place among the fields and properties featured in *Coal Age* in past years, while an active group of strippers are second to none in the use of modern equipment and methods. Thus, they become worthy successors to those earlier practitioners of the art in Ohio, one of whom, in 1915, installed probably the first electric shovel of any size—6 cu.yd.—to be used in stripping.

ELECTRICITY still powers the shovels at those operations using large equipment, and is supplemented by tractor-trailer haulage. Working under identical conditions, except that the overburden limit is lower, small-unit strippers using shovels with internal-combustion engines follow substantially the same methods. In several instances, these operators call in large tractor-powered scrapers to help with or handle the entire stripping job. Spoil-bank reclamation is an active adjunct to stripping at a number of properties.

THE PIONEER loading-machine installation in the eastern Ohio No. 8 field was made in 1925. The list of users still grows. Higher-capacity machines are being adopted and with them such other modern auxiliaries as big mine cars, shuttle cars and track-mounted cutting and shearing machines. The initial shaker-conveyor installation in 1929 soon gave way to other equipment, but new installations in 1937 touched off a period of expansion which still continues. Wide use is made of mother belts and automatic loading heads.

THE COMPLETE picture of mechanical-mining progress must include reference to the relatively unfavorable natural conditions, including drawslate and a substantial thickness of other weak top members. Mobile-loader operations take down the drawslate. Shaker-conveyor operations "float" it on plank. Both find special measures necessary for the protection of haulage and other openings. Heavy rail in many cases is supplemented by treated ties, welded joints, automatic switchthrowers and block signals.

PROVISIONS for power supply and maintenance of equipment at eastern Ohio No. 8 mines reflect management's appreciation of the vital part these activities play in low-cost operation. The same respect is accorded ventilation and other measures for health, safety and efficiency. These include rock-dusting, sprinkling, permissible explosives and blasting devices, electric cap lamps and all types of protective clothing.

PREPARATION climaxes the production cycle in all fields. No. 8 developments include a steady growth in the number of mechanical plants in service and in the adoption of other newer measures for satisfying consumer requirements. The details to round out the picture in all other surface and underground activities, as well as in preparation, constitute the meat of this issue and stand as impressive testimony to the determination of eastern Ohio No. 8 producers to yield no ground in the battle for efficiency, low cost and safety.

MINING WITH MOBILE LOADERS

Eastern Ohio No. 8 Field

WITH AROUND 5 ft. of coal, and bad top, mines in the No. 8 field of eastern Ohio employ both mobile loading machines and shaker conveyors to cut costs and preserve their competitive position. Mobile equipment includes both track- and crawler-mounted loading machines, mostly served by mine cars but several with rubber-tired haulage units. On the conveying side, while both hand-loaded and self-loading shakers are employed, the trend is toward the latter. Mother belts are used with practically all the shaker installations employed in rooms, with shaker gathering conveyors for the remainder. Mobile loaders are employed for development at one shaker-conveyor operation and are under consideration at others.

Although the pioneer installation of mechanical-loading equipment at mines surveyed in this issue of *Coal Age*—mechanized deep and strip operations in the No. 8 seam in Belmont, Harrison and Jefferson counties—took place as far back as 1925, the major part of the installations covered have been made within the last two years. The Wheeling Township Coal Mining Co. purchased a Joy 5-BU loading machine in August, 1924, and put it in operation June 1, 1925. On March 1, 1928, the company went 100 per cent mechanical, and on June 15, 1928, started double shifting.

Shaker conveyors with duckbill self-loading heads were installed at the Fairpoint No. 9 mine, since worked out, by the Hanna Coal Co. early in 1929. This equipment was used primarily in development work and was extended to certain other Hanna operations. In July, 1930, Hanna started replacement of shaker equipment with Whaley "Automat" track-mounted loaders, and now all its properties are completely mechanized with "Automat" and Goodman track units.

The first of the Goodman shaker conveyors, now used by some eight mines in the eastern Ohio No. 8 field, with more installations scheduled, was put in at the Witch Hazel mine, Florence Coal Co., in 1937. Powhatan Mining Co. began using mobile loaders to develop for shaker conveyors when it started mechanical mining at Powhatan Point mine in 1939, and at the time of the *Coal Age* survey had in service two Joy 8-BU, two 7-BU, and two Jeffrey L-400 loading machines, the latter acquired in 1940 and '41.

The first Joy shuttle-car installation in the country was made in 1938 at Hanna's Dun Glen No. 11 mine, although soft bottom later forced discontinuance of this equipment. A cable-reel car was installed in 1939 at another property not included in this survey because changes in equipment and methods were being made. In 1940, Blaine mine, Lorain Coal & Dock Co., was equipped with four 7-BU loaders served by eight shuttle cars in room work, plus two more loading machines served by mine cars for development. Two cable-reel cars were acquired by Wheeling Township, followed, in 1941, by an experimental Lee-Norse "Koal-Mobile," operated with a belt-type mother conveyor.

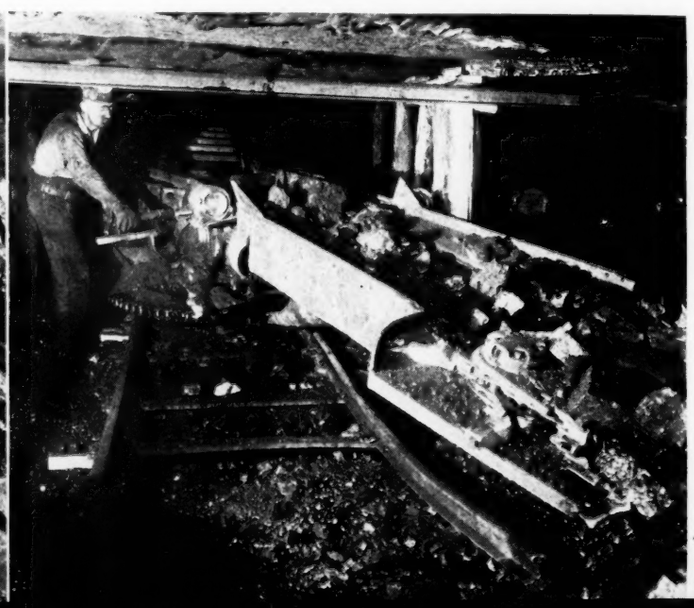
Five operations using mobile machines were included in the *Coal Age* survey. Construction work at Piney Fork No. 1, Hanna Coal Co., now being converted to Goodman 360 track-mounted loaders, supplemented by Jeffrey 29-U cutters and Chicago Pneumatic post-mounted drills, had not been completed when field work was terminated, and consequently no detailed study was made. Methods, however, are substantially similar to those at other Hanna mines. The majority of the five operations (six with Piney Fork No. 1) have, as stated, been completely mechanical for several years.

The six shaker-conveyor operations covered, however, all are comparatively recent additions to mechanized-mining ranks. Automatic duckbills are used at two properties and are installed on part of the equipment at a third. Hand loading is the practice at the other three, with some considering duckbills.

From the standpoint of tons per man employed underground, there is little difference in the average for the mines using the two classes of equipment. For the five mobile-loader operations, excluding hand loaders used in one or two cases to meet late increases in demand, average output per man employed underground was 10.4 tons. This was derived from replies to questions as to (1) average tonnage of mechanically produced coal shipped per day and (2) number of men

Track-mounted loading machine at work in a room in Willow Grove No. 10 mine.

Advancing into a fall of room coal with track-mounted loader at Dun Glen No. 11.



charged to mechanical production underground. The range for the five properties was 9.2 to 10.6 tons. Material rejected in preparation seldom is less than 10 per cent, and sometimes runs 20 or more.

Hand-loading to fill the gap pending additional equipment also is the practice at one shaker-conveyor operation, and is used for development at two others. Excluding hand loading for production but including such work to develop for conveyors, average tons per man underground for the six shaker operations was 10.1, shipped-coal basis. The range was 6.7 to 11.2 tons per man underground. Since there is greater opportunity for eliminating refuse in the mine, preparation reject at most probably does not exceed 10 per cent.

Practically all the properties surveyed have been in operation many years. Thus, hauls are long and general labor underground is correspondingly increased. This is one factor in the relatively lower showing per man employed underground at mobile-loader operations in the eastern Ohio No. 8 field. But the major factor, in the opinion of the district, is natural conditions. Average seam thickness, for example, seldom exceeds 5 ft., and horsebacks, rolls and slips are frequent.

Weak Top Includes Slate

The real villain, however, is the top, which includes a layer of drawslate, or "stone," lying on top of the coal, followed by a "rider" seam and then up to 15 ft. of soft unconsolidated limestone. While there are local variations, there seldom is less than 8 to 10 ft. of weak material on the coal. In mobile loader operations, the practice is to take down and load out or gob the drawslate and then depend upon the rider seam and plenty of timber to hold the remainder of the loose roof. Thus, handling drawslate, exclusive of timbering, may require as high as 15 per cent of the total underground force. And, since large open spaces cannot be left, there is no opportunity for connecting room track through crosscuts to shorten car change, further explaining the lower underground efficiency compared with other regions.

In shaker-conveyor operations, the drawslate normally is held in place, usually by "floating" it partly or completely on crossbars—generally the latter. Elimination of handling drawslate and other loose material is one of the major reasons why conveyor efficiency approaches that of mobile loaders.

Resting on a very soft to hard fireclay bottom, the No. 8 seam in eastern Ohio occasionally thins down to 40 in. or less, with the maximum at the mines surveyed reported as 70 in. The average at the eleven operations studied in detail was 56 to 64 in. With few exceptions, the coal is overlaid by drawslate, or "stone," as much as 5 ft. thick. The usual thickness, however, is about 12 in. Over the drawslate (Fig. 1) is a "rider," or "rooster," seam, except in limited areas. While the rider may thicken to 40 in. or more, the average is approximately 12 in. Over it is a soft, unconsolidated lime stratum, also called "soapstone," "fireclay," etc., seldom less than 4 ft. thick and occasionally expanding to 14 or 15 ft. The average is around 6 to 8 ft., including near the top at a few operations some 18 to 24 in. of "bastard" limestone. Next, usually 8 to 12 ft. above the coal, is the hard Panhandle limestone.

General dip is around 1 per cent southeast. Except along the Ohio at the southeastern edge of the field, where shafts and slopes are the rule, the seam outcrops above drainage, so that drift openings predominate. This same condition also results in irregular working areas requiring major deviations, in some cases, from entry courses and panel plans. Depth of cover varies from outcrop to 600 ft. on the southeastern edge, with the average at this point around 400 ft. Most mobile-loader and shaker-conveyor operations, however, average 150 to 200 ft. Rooms, therefore, are driven 22 to 30 ft. wide, leaving pillars 7 to 10 ft. thick, which are not recovered. The mine under the deepest cover, incidentally, drives 30 ft. wide on 40-ft. centers, using shaker conveyors and "floating" the drawslate.

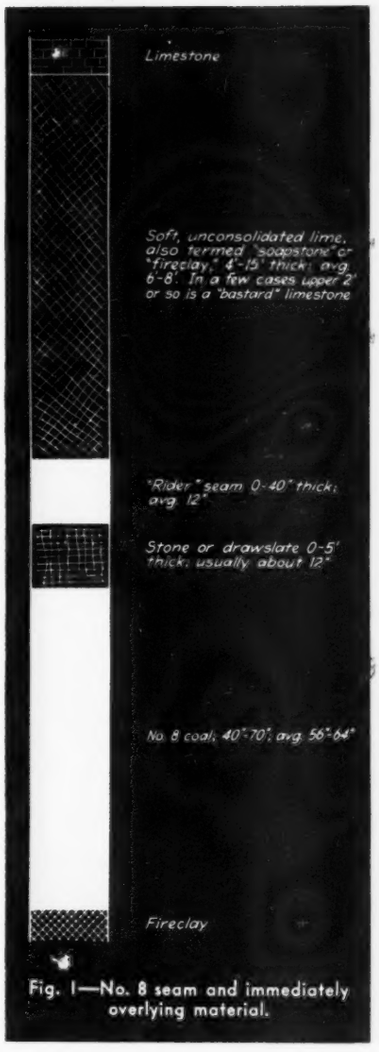
Mobile Loaders at Drifts

The mobile-loader operations (see p. 65 for conveyor mining) are, as stated, drift mines. Three and four headings make up the main entries, with Willow Grove No. 10, Hanna Coal Co., reducing the number from four and five to three on the theory that two aircourses cleaned to the solid limestone provide all the area necessary and are much easier to maintain. Haulways at Willow Grove and other Hanna mines usually are 10 ft. wide; aircourses, 12 ft. Heading centers are 40 ft. Blaine and Wheeling Township No. 2 mines, on the other hand, are developed with four headings—9 to 10 ft. wide on 26-ft. centers at Blaine and 8 to 9 ft. wide on 30-ft. centers at No. 2.

The panel system, or some modification, is employed at most operations. At the Hanna and Wheeling Township mines, the room sections, or panels, are completely surrounded by unbroken pillars except where the headings enter. Blaine cuts rooms from one panel into the next, but leaves a pillar between panels driven toward each other.

Although most mobile-loader operations drive two room headings, others, such as Blaine, have gone to three to provide more working places for development machines and facilitate haulage and supply service. Hanna also is experimenting with driving three panel, or room, headings, primarily for more coal in development. As yet, however, standard Hanna room entries comprise two headings about 10 ft. wide on 40- to 45-ft. centers. Two headings also are driven at Mine No. 6, J. H. Somers Coal Co., while Wheeling Township No. 2 starts with four to facilitate installation of trip-changing sidetracks and then drops to two 8 to 9 ft. wide on 30-ft. centers.

Retreat work within room panels is the rule at most mines, with some driving to the boundary or other limit and working full retreat. All operations employ development machines, usually with small crews.


Limestone
Soft, unconsolidated lime, also termed "soapstone" or "fireclay," 4'-15' thick; avg. 6-8'. In a few cases upper 2' or so is a "bastard" limestone
"Rider" seam, 0-40" thick; avg. 12"
Stone or drawslate 0-5' thick; usually about 12"
No. 8 coal, 40"-70"; avg. 56"-64"
Fireclay
Fig. 1—No. 8 seam and immediately overlying material.

Rooms are turned on a 60-deg. angle at Hanna mines, leaving an approximately triangular pillar along the main entry, worked on final retreat by short angle places. At Willow Grove No. 10, where six Whaley "Automat" loaders in wide work and three in narrow were producing 4,300 to 4,500 tons of cleaned coal per day of three shifts, the usual development crew was made up of a loader operator, two machinemen, motorman, snapper and tracklayer. Recently, crews have been expanded at times to nine men by adding a loading-machine helper, postman and second tracklayer. In either case, a development unit comprised a loading machine, Oldroyd track-mounted cutting machine with 9-ft. bar, Chicago Pneumatic 472 post-mounted drill, and Jeffrey 6-ton cable-reel locomotive. Track now is 40- instead of 30-lb.

The usual development territory is three main or two room headings plus

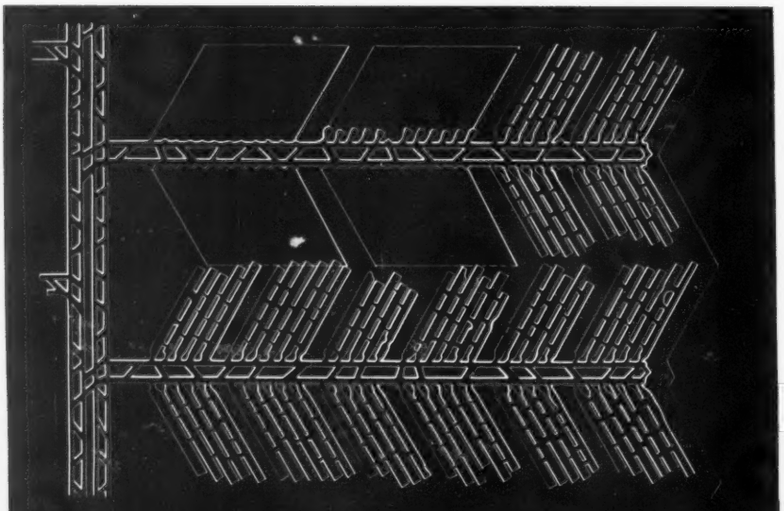
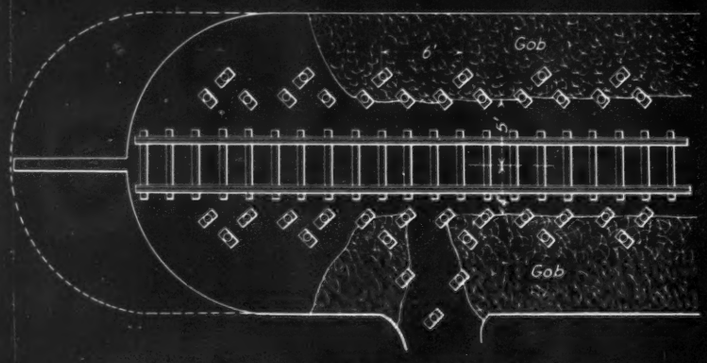


Fig. 2—Room-panel mining system, Willow Grove No. 10.



Drawslate shot down and gobbed or loaded after each cut. Crossbars frequently are substituted for posts ahead of gob line.

Fig. 3—General plan of posting at Hanna operations. Posts are supplemented by crossbars at the face when conditions warrant.

crosscuts, room necks and other openings. The initial cuts are taken out of the necks as the headings are driven up. Then, a wide-work machine comes in or the narrow unit is turned into a wide. On this basis, six-man development crews were turning out 75 to 80 tons of cleaned coal per shift; nine-man crews, 120 to 130 tons per shift, using cars holding 4½ tons.

Wide-work units at Willow Grove No. 10 are the same as narrow, whereas the crew—215 to 220 tons per shift—consists of a loader operator and helper, cutter and helper, driller and helper, who also shoot; motorman and snapper; two timbermen; one trackman; and two "preparation" men. A wide-work territory usually is ten rooms on one side of the entry, with groups of five separated by a pillar made by omitting a place, as in Fig. 2. Rooms at Willow Grove No. 10 are 22 ft. wide (30-ft. centers) and 300 to 325 ft. deep. They are necked 10 ft. for about four cuts and then widened both ways. Changing is done on the entry.

Dun Glen No. 11 was using seven Whaley "Automat" and one Goodman 360 loading machines in producing 3,950 tons of cleaned coal in three shifts. Development units are the same as at Willow Grove (except for 473 drills). Crews comprise six men, averaging 75 to 80 tons per shift out of two or three headings and accompanying crosscuts, room necks, etc.

One wide-work unit at Dun Glen was made up of the 360 loader, Jeffrey 29-U cutter with 9-ft. bar, 473 drill, and Jeffrey 6-ton cable-reel locomotive. The others are the same, except that "Automats" and Oldroyd cutters are employed. Wide-work crews differ from Willow Grove in number of "preparation" and clean-up men. At Willow Grove, the drawslate is shot with the coal and only what can be reached is gobbed. The rest is loaded. At Dun Glen, the drawslate is shot separately and all gobbed in rooms, although loaded in headings. Consequently, a Dun Glen wide-work crew comprises an operator and helper, two cutters, driller and shooter, who work together, motorman and triprider, one trackman, two postmen and six "preparation" and clean-up men. With the "Automats," such crews average 240 tons of cleaned coal per shift in rooms 22 to 24 ft. wide on 32-ft. centers, 300 to 325 ft. deep. Average for the Goodman loader was running 300 tons per shift. Dun Glen machines are served by 225-cu.ft. (8-ton) mine cars changed on the entry.

The Dun Glen No. 11 cycle starts with setting props and drilling and shooting the drawslate. Two men, as noted, handle this work. Timbering, done substantially as in Fig. 3, is based on two rows of posts, each with cap, on each side of the track. One foot extra clearance is provided on the operator's side. The postmen are followed in rooms by clean-up men, or "stonemen," who break the drawslate and gob it in the timbers. The place then is cut, drilled, bugdusted, and the track laid up. Next comes shooting, which usually brings down some of the drawslate. One man, with help as required, precedes the loader to pull off as much as possible, shovel up loose coal and otherwise prepare for loading.

Crossbars Set at Face

Since drawslate at Willow Grove No. 10 is shot with the coal, gobbing is omitted. Otherwise, the cycle is substantially the same, including a man to prepare falls for loading. In addition to posts, Willow Grove employs crossbars at the face in many sections. These are moved forward as the regular posting is advanced. Most bars are 60- to 90-lb. rail, with some 4-in. aluminum H-beams. At Piney Fork No. 1 mine, crossbars are made of 4-in. H-beams (7½ lb. per foot) 17 and 20 ft. long, stiffened by short plates between the flanges at the ends and center. These bars are carried on Simplex and Duff-Norton jacks.

With one 5-BU in development and two 7-BU's in wide work, Mine No. 6 (J. H. Somers) gets out 600 to 700 tons in two shifts, loading into cars holding 2½ to 2¾ tons. A unit consists of a loader, 50-hp. Goodman shortwall with 7¾-ft. bar, Jeffrey A-7 hand-held drill and 6-ton Jeffrey locomotive. An entry-work crew includes two machine men, who also drill and shoot; loader operator and helper; and motorman. The operator, helper and motorman timber, lay track, handle drawslate and do other necessary work. Average output is around 40 cars per shift.

Wide-work crews (70 cars per shift in rooms 24 ft. wide on 33-ft. centers, driven 250 ft. deep with changing on the entry) usually comprise a loader operator and helper, accompanied by a slateman; two cutters, who also drill; one shotfirer, who also bugdusts and lays track; motorman and snapper; and three men posting and handling drawslate. The cycle begins with timbering (two rows each side in rooms), followed by shooting and gobbing the drawslate. Other operations follow in the usual order. The slateman with the

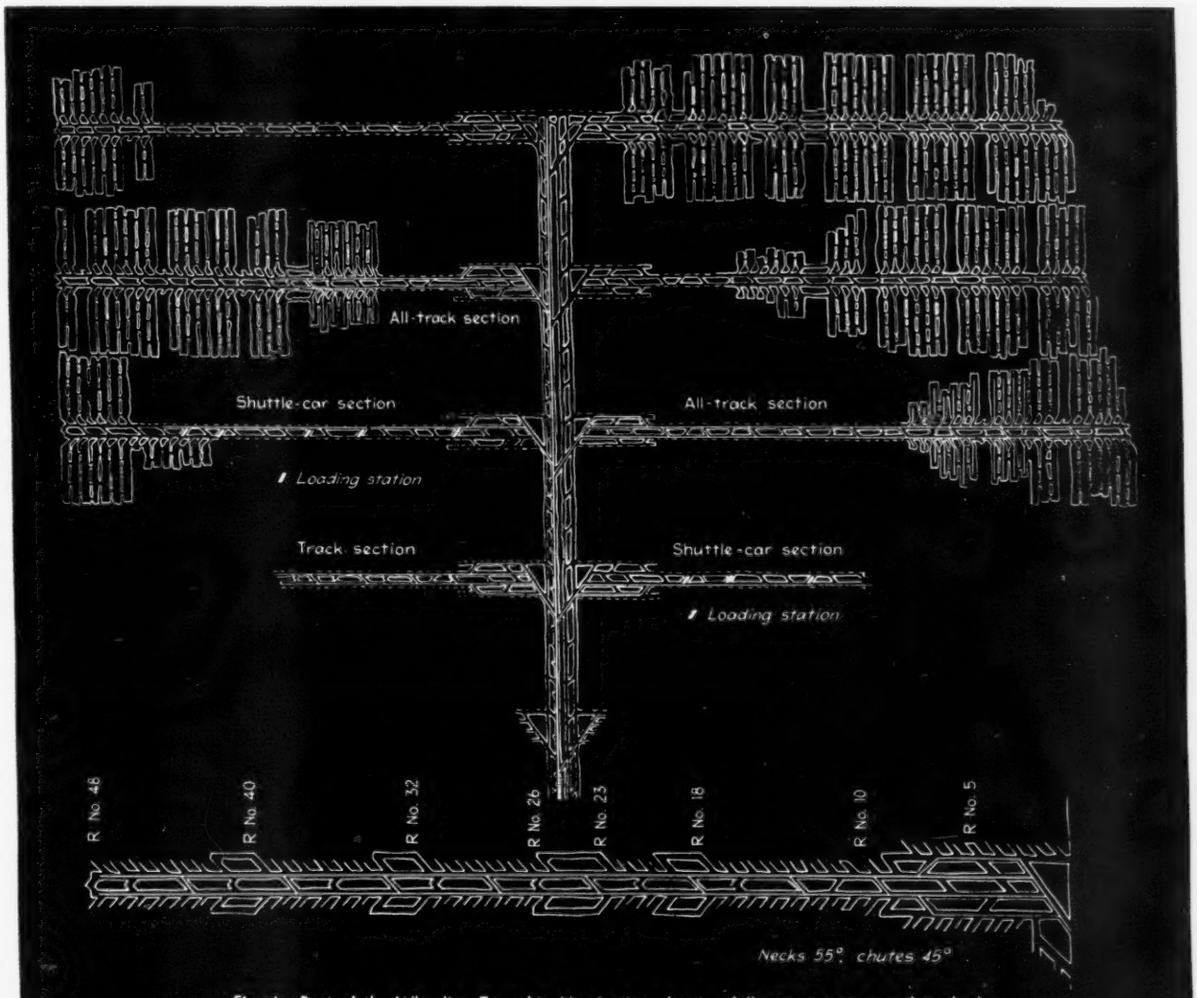


Fig. 4—Part of the Wheeling Township No. 2 mine, showing full-retreat system and method of developing and working room territories with both rubber-tired equipment and mine cars.

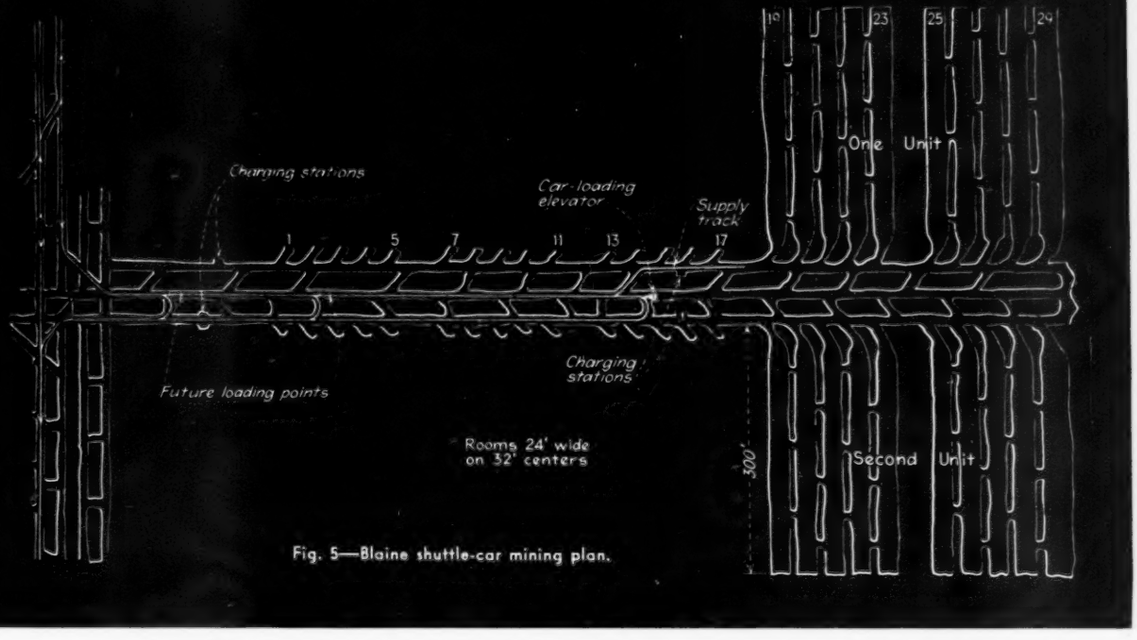
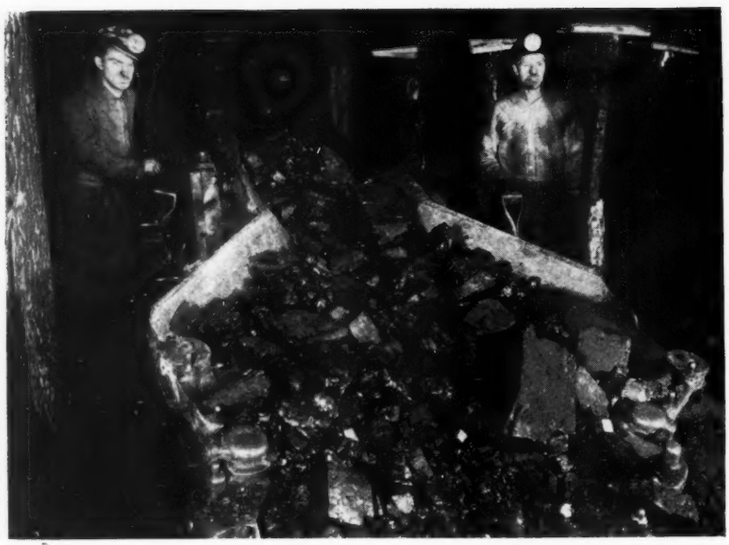


Fig. 5—Blaine shuttle-car mining plan.



Crawler-type loading machine working in a room in mine No. 6. Note double-row posting which prevails generally in mobile-loader mines in the field.

loader assists in removing and gobbing material which comes down when the coal is shot. The usual wide-work territory is five rooms.

Full retreat is the rule at Wheeling Township No. 2 mine. Using eleven 7-BU's in both narrow and wide work, No. 2 averaged 1,620 tons of cleaned coal per shift, three shifts per day, in March, loading into both shuttle and 3-ton mine cars. One type of entry-driving unit includes a 7-BU, Jeffrey 29-U cutter with 9-ft. bar, Jeffrey A-6 or Chicago Pneumatic 473 post drill and 4-ton Jeffrey cable-reel locomotive. In two others, the 7-BU is accompanied by a 5-ton Joy cable-reel shuttle car and a crawler-mounted 29-U cutter. Six-man crews develop, and a territory is two to four headings 8 to 9 ft. wide plus room necks, crosscuts, etc. Shuttle-car entry units also include Joy elevating conveyors. These conveyors, as indicated in Fig. 4, are set in angle crosscuts to discharge to cars in the opposite heading.

In opening a panel, or room, section, the development machine customarily drives the room necks two cuts on a 55-deg. angle. Four headings are driven at the start, but the outside ones are continued only far enough (Fig. 4) to install empty and loaded partings. The standard room panel is 48 rooms long on a side, although only 42 are worked. The other six are omitted to form "anti-squeeze blocks," with a larger block (Fig. 4) in the middle of the panel. Rooms are 26 ft. wide on 34-ft. centers and are driven 225 ft. deep. Since all work is from the boundary out and no barrier pillars therefore need be left, rooms are turned down to the main entry to complete extraction.

One 29-U normally cuts for two loading machines in rooms, and a wide-work unit (usually nine rooms with occasionally some necks in advance) therefore comprises a 7-BU, one-half a 29-U, Jeffrey A-6 post drill and 4-ton Jeffrey cable-reel locomotive. Crews include a loader operator; one-half a two-man machine crew; driller and shotfirer, who work together; tracklayer, who also timbers; motorman; triprider, who acts as loader helper; and three slatemen. Two rows of posts are set on each side of the track and the drawslate is shot down and gobbed, except in headings, where it is loaded out. The track then is advanced and the place cut, drilled, bugdusted and shot. Car changing is done on the entry.

A Lee-Norse 6-ton cable-reel "Koal-Mobile" with Joy mother conveyor was engaged, at the time of the *Coal Age* survey, in developing a trackless room panel. Plans called for equipping the panel with two loading machines, each served by two rubber-tired cars discharging directly onto the belt. Mine cars are fed past the belt discharge on the main entry by a remotely controlled Sullivan hoist. During development, the 7-BU was served by the single "Koal-Mobile," dumping onto the end of the conveyor. To handle the "Koal-Mobile" discharge, the 30-in. Goodyear belt is driven at 420 f.p.m. by a 40-hp. Reliance motor.

Develop With Mine Cars

Development machines at Blaine mine are served by 1½-ton mine cars and 4-ton Jeffrey cable-reel locomotives. Two units (7-BU loaders, CP 473 drills and shortwall cutters with 7½-ft. bars) were in service, with crews as follows: loader operator, machineman and helper, motorman and brakeman, and one timberman, who also handled shooting and other face-preparation work. Territories were three headings plus crosscuts, room necks, etc., making three to five places 9 to 10 ft. wide. Average output was 55 tons of cleaned coal per shift.

Four wide-work units were in use at Blaine, and these, with the two development units, were accounting for 2,300 tons per day of two shifts. A wide-work unit comprises a 7-BU, Jeffrey 35-BB or Goodman 12-DA shortwall cutter with Joy T1-1E crawler-mounted shortwall truck, 473 post-mounted drill with truck, two Joy 42-D6 or 42-D5 5-ton shuttle cars (Philco batteries), charging station, Joy elevating conveyor and 10-ton Jeffrey car-spotting locomotive. In addition to the face boss, a crew consists of a loader

Battery shuttle car getting a 5-ton load in a room at the Blaine mine.

Cable-reel shuttle car at work in entry in Wheeling Township No. 2 mine.

operator and helper, machineman and helper, driller, shotfirer, two postmen, three slatemen, preparation man, two shuttle-car drivers, elevator operator and motorman. A unit territory is ten rooms 24 ft. wide on 32-ft. centers and 300 ft. deep. Average wide-work output was 220 tons of cleaned coal per shift.

While a shuttle-car mining plan still was being evolved at Blaine, it is expected that the projection in Fig. 5, with perhaps a few modifications, will be used in most cases. The headings may be driven with mine cars or shuttle cars, necking rooms as warranted and making provisions for loading stations. When room production starts, one unit will take ten places on one side and a second ten places on the other. Each group of five places (Fig. 5) is separated by a solid "squeeze block" made by eliminating a room. When the inby rooms are worked out, the second ten-room groups will be worked, leaving a final group of five rooms on a side for the third loading station. Trips will be pulled around the circle in front of each elevator, and provision is made for back-switching to keep endgates in the right position. Supplies will be brought in on short stub tracks normally installed as in Fig. 5.

Upon completion of loading in a room at Blaine, the postmen advance the timbering (two rows of posts on each side of the 8½-ft. shuttle-car roadway). Ordinary caps are used next to the rib, with 3x5x24-in. half headers along the roadway. The postmen then drill and shoot the drawslate, which is gobbed in the timbers by the slatemen. In headings, the drawslate is shot down on the coal and then slid off and loaded into separate cars.

Cutting follows posting and gobbing drawslate in rooms, which then are drilled and bugdusted. Holes are loaded and set off by the shotfirer, who normally works with the drill crew. Finally, a preparation man shovels up loose coal, cleans off any drawslate which may have come down and otherwise prepares the place for the loader. Two Simplex or Duff-Norton roof jacks with 2x5x24-in. headers bolted on are kept in each room. These are set by the stoneman before the place is cut, one 4½ ft. to the right of the center and the other 4½ ft. to the left about 30 in. from the face. One long and two short jacks are carried on each Joy for use during loading.

SHAKER-CONVEYOR MINING

Eastern Ohio No. 8 Field

USING shaker equipment and normally "floating" the drawslate over the No. 8 seam on timber, conveyor mines in Belmont, Harrison and Jefferson counties covered in the *Coal Age* survey of eastern Ohio mechanical operations are able to get an underground efficiency nearly equalling that of mobile-loader mines in the district. Average output per man employed underground at mobile-loader properties studied (p. 60) was 10.3 tons of cleaned coal. Average at the six shaker-conveyor mines was 10.1 tons, with the range as 6.7 to 11.2 tons, the higher figures, as a rule, reflecting primarily the use of self-loading heads (automatic duckbills).

Most of the conveyors have been installed within the last two years, and the majority are accompanied by mother belts, although shaking gathering conveyors are used at two properties. While some developing is done by hand, two- or three-shaker set-ups lead, with one mine developing with mobile loaders.

Natural conditions include an average of about 5 ft. of coal overlaid by 12 in. of drawslate, or "stone," followed (Fig. 1, p. 61) by a 12-in.-average "rider" seam and loose unconsolidated lime usually 6 to 8 ft. thick, although the range is approximately 4 to 15 ft. Horsebacks, slips and rolls are frequent. At two operations, one a slope and one a shaft, maximum cover is 600 ft.; average, 400 to 450. At the others, where the coal outcrops above drainage and drift openings have been made, cover seldom exceeds 300 ft. and averages between 100 and 150. Average coal thickness runs from 56 to 64 in. at the various mines. Room width ranges from 24 ft. on 33-ft. centers to 30 ft. on 40-ft. centers, the latter, in one case, at the mine with the deepest cover.

All the shaker-conveyor installations are in relatively old mines. Some are among the earliest producers in the field. Since old entry standards often were not considered suitable, new plans were adopted at the majority of the mines. In some instances, number of headings comprising a main entry was increased, and at most mines three instead of two room headings are being driven, with the center for a mother conveyor and one or both outside ones for supply tracks.

First in the field to use the Goodman shaker conveyor, starting in 1937, Camel Run mine, Warner Collieries Co., and Witch Hazel mine, Florence Coal Co., also employ shakers for gathering. At Camel Run, the mother shaker discharges directly to mine cars. At Witch Hazel, an elevating conveyor is employed. The coal is loaded onto the conveyors by hand at both operations and swivels are not used at the faces. Six G-12½ room shakers served by one G-20 mother shaker and two G-12½ units driving room entries were accounting for some 900 tons in three shifts at Camel Run at the time of the *Coal Age* survey. Around 25 hand loaders also are employed in development and recovery of odd pieces of coal, and were averaging 100 to 110 tons. Witch Hazel was using four Type E room shakers, G-15 mother shaker and elevating conveyor, and one G-12½ machine for either room or entry work, and with this equipment was averaging about 675 tons in three shifts. About 30 hand loaders (development and other work) were getting approximately 175 tons. Average per faceman in rooms at Camel Run was 15.4 tons per shift; Witch Hazel, 14.3 tons, including gobbing of drawslate. Facemen in headings were averaging 9 tons.

Room territories at Camel Run are opened by two headings 12 ft. wide on 40-ft. centers. These headings are driven to their full depth, necking the rooms 12 ft. wide and two to three cuts deep, or enough to set the drives and the initial pan sections. In advancing a room entry, only one shaker drive is employed. Two swivels are used, however, and the practice is to first load in one heading, then break the pan line ahead of the drive and connect to the first of the swivels leading through the slant to the opposite heading. Thus, while two pan lines are operated, only one drive, plus a 91-E elevating conveyor, as indicated in Fig. 1, is necessary. In addition to the drive, swivels and pans, an entry unit includes a Chicago Pneumatic 472-BR drill, two Goodman standard or universal shortwalls with 7½-ft. bars, one in

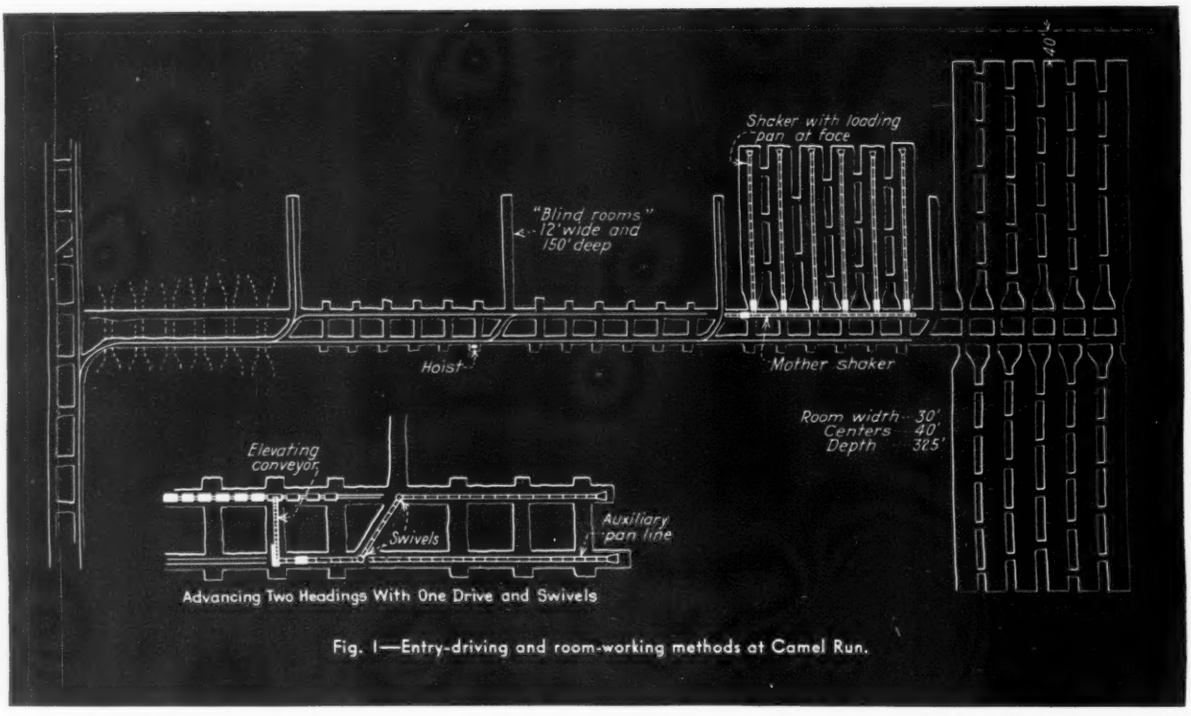


Fig. 1—Entry-driving and room-working methods at Camel Run.

each place, and a "Brownie" HGF car-spotting hoist. A crew consists of three to five men (usually four), one at the elevating conveyor.

"Blind rooms" are driven on the advance, using a 90-deg turn. These openings, 12 ft. wide and 150 ft. deep, are made in the solid pillars between groups of rooms (Fig. 1), for car storage as desired. Their adoption has materially facilitated changing trips and is the major reason why increasing headings to three has not been necessary. Plans call for extending this system to Witch Hazel also.

Rooms are mined from the inside out at Camel Run. A typical set-up, including hoist and track locations, is shown in Fig. 1. Aside from the shakers, the unit includes a drill and shortwall in each place and a remotely controlled "Brownie" HKG car-spotting hoist. Rooms are necked 12 ft. wide and driven 30 ft. wide on 40-ft. centers and 325 ft. deep. A standard crew comprises 15 face men (five for each two places), one man at the car-loading station and a face boss. Four men (two one shift and one each on the others) handle supplies.

Entry-driving at Witch Hazel, when the shaker is employed, is substantially the same as at Camel Run, although "blind rooms" were yet to be adopted. Room width and centers (30 and 40 ft.) are the same, but depth is less—280 ft. A room unit may consist of four Type E shakers, G-15 mother shaker, 40-ft.-long 90-A elevating conveyor, and "Brownie" hoist. Usually, however, the G-12½ machine is added, making five room shakers in all. Other equipment includes a Black & Decker hand-held coal drill and Goodman 12-DA shortwall with 6½-ft. bar in each room. In contrast to other operations, the drawslate usually is taken down after each cut. The unit crew (five room shakers) comprises 15 facemen, one man at the loading station and one supply man, plus foreman.

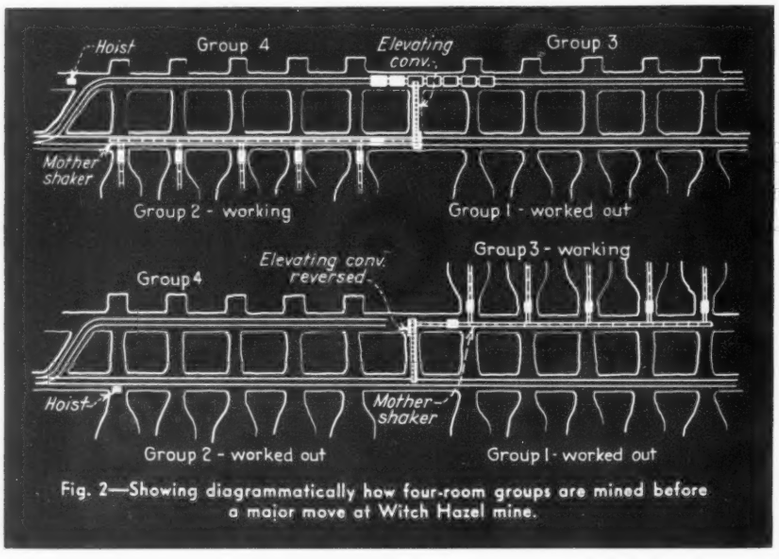


Fig. 2—Showing diagrammatically how four-room groups are mined before a major move at Witch Hazel mine.

Four Set-ups Per Move

Using the long elevating conveyor, four set-ups may be worked before a major move is made at Witch Hazel. As shown diagrammatically in Fig. 2, five inby rooms, yielding approximately 7,500 tons, are worked out with the mother shaker in the heading track. Without moving the elevating conveyor, the mother shaker then is moved outby and set up, again in the track, to work five more places. Then the elevating conveyor is turned end for end to switch the loading to the opposite heading and the room unit is moved to the third five-room group, opposite the first worked. After the fourth group, a major move is in order.

Moving from one to another five-room group was requiring 97 man-hours and was done in one 7-hour shift. Making the major move to the next location was taking two 7-hour shifts (188 man-hours). Thus, total man-hours moving for approximately 30,000 tons is three times 97 plus 188, or 479.

Other shaker-conveyor operations were using belts for mother conveyors, and at most of these properties average moving cost over lengthy periods was running 2 to 2½c. per ton.

Hand-loaded shaker conveyors were installed at Crow Hollow No. 1 mine, United States Coal Co., in October, 1940, and plans have been drawn up to supplement them with duckbills. At the time of the *Coal Age* field work, the nine G-12½ machines were made up into two units. One of six conveyors plus 97-C-26 mother conveyor (26-in. Goodyear belt) was used in room work and another of three conveyors with belt was used in barrier recovery. Average output (three shifts) was 1,300 tons per day.

While shakers had not yet been used in entry driving, a three-conveyor set-up with 90-deg. turns and elevating conveyor was contemplated. Both main and room entries include three headings 10 to 11 ft. wide on 32-ft. centers, with the drawslate taken down in the center. On main lines, the center heading, or haulageway, will be Gunited where necessary, passways and loading stations will be located, and everything prepared for full-retreat operation. The mother belt occupies the center heading on room entries.

Loading out the right-hand side in a room in Crow Hollow No. 1, with swivel in the foreground. The drawslate is held by planks and jacks.

Rooms Worked Retreating

Rooms 28 ft. wide on 35-ft. centers are worked from the inside out. Depth with hand loading was 350 to 380 ft. Contemplated for duckbills is 280 to 300 ft. Three rooms are worked on each side at a time, with the six shakers feeding onto the belt through crosscuts opposite the room necks, 12 ft. wide and two to three cuts deep. Necks, crosscuts, etc., are driven by short ¾-hp. 95-16 belt units. The outside conveyor of three finishes first and then moves down three places, clearing the way for the next.

Aside from the shakers, mother belt, 95-16 conveyors and "Brownie" Model HKC hoist, the Crow Hollow room unit includes a CP 473 drill and shortwall cutter in each place. Present 6-ft. bars are being changed to 7½, and six new Goodman 612-AB machines with 7½-ft. bars were on order. The room-unit crew consists of 18 facemen (three per place), a "boom-man" (loading cars), two or three supplymen, an electrician and a boss. The barrier crew (three shakers) is made up of 13 men—four in each place, handling their own supplies, plus boomman. Posts and planks, pans, and other equipment are recovered from worked-out places by a crew averaging three men. Aside from equipment, recovery is about $3 worth of material per $1 of labor.

Two entry and two room units (22 conveyors, 14 with duckbills) were in operation at the Dorothy mine, Youghiogheny & Ohio Coal Co., and were producing 2,760 tons per day of three shifts. Each entry unit was made up of three G-12½ shakers and A-1 duckbills, two 90-deg. turns, one 90-L elevating conveyor, three Jeffrey 35-B shortwalls with 7½-ft. bars, three Jeffrey A-6 post drills, one or more 95-16 belts for opening room necks, etc., and one "Brownie" HKL hoist. A crew included six facemen, one laborer (timbering, etc.), one "loader-head-man," or car-trimmer, and one-half a face boss.

One room unit with duckbills was being used where the typical drawslate was absent—a local condition not expected to endure. It was made up of six G-15 and two 12½ shakers, each with duckbill; La-del belt conveyor, eight 35-B cutters, eight A-6 drills and "Brownie" HKD hoist. The other room unit (hand loading with the drawslate "floated" on timber) is the same except for omission of duckbills. A few Joy "Catapullers" are on hand for moving equipment. The La-del conveyors (30-in. U.S. Belts) are extensible to 770 ft. A spare head-and-tail section and 300 ft. of line permit setting up in advance in new sections.

A room-unit crew comprises 24 facemen (three per place), four timbermen and helpers, "boom-man," two men recovering timber and taking care of odd jobs, one boss and one man one shift a day sprinkling. With no drawslate, the duckbill unit was producing 1,100 to 1,200 tons in three shifts, compared with 800 to 900 tons off the hand-loaded unit under the drawslate.

Entries at Dorothy consist of three headings 10 ft. wide on 30-ft. centers. In driving, one shaker and the elevating conveyor are set up in the center head-

Elevating conveyor receiving coal from mother shaker at Witch Hazel.

Loading out the center shot in a room at Camel Run, using loading pan.

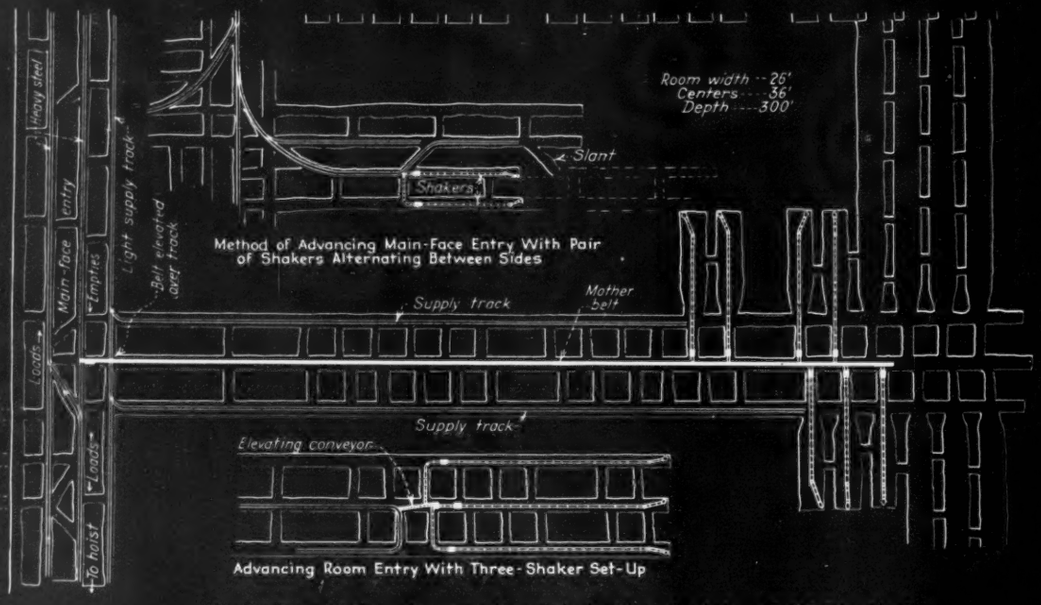


Fig. 3—Entry-driving and room-working methods with mother belts at Rail & River No. 3.

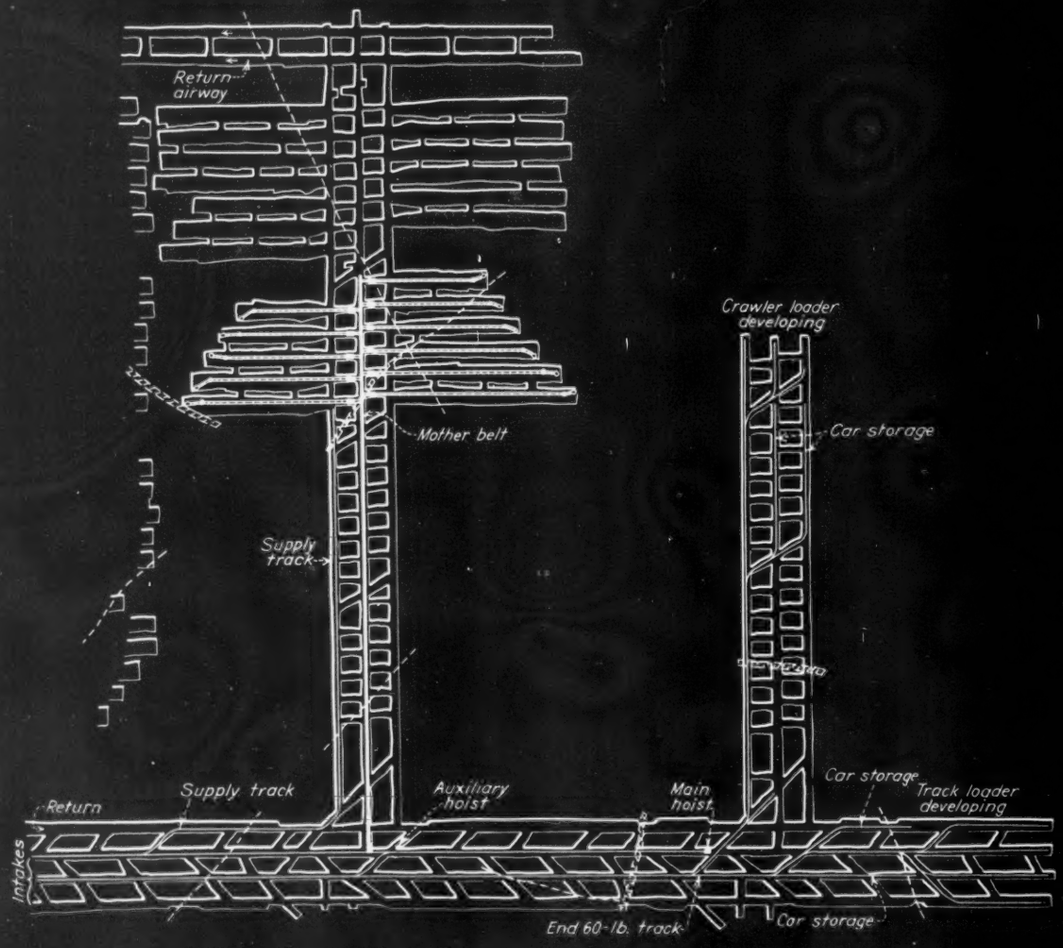


Fig. 4—Development with mobile loaders and room work with shaker conveyors and mother belts at the Powhatan Point mine.

ing, and 90-deg. turns are used on the conveyors in the side headings. Crosscuts from the center to the side openings provide space for the initial room-conveyor set-ups. Rooms are necked 12 ft. wide and are driven 24 ft. wide on 33-ft. centers to a present depth of 265 ft. Conveyors are set up four on a side starting inside. Where possible, the outer rooms in a group are finished first and the conveyors moved down four places to clear the way for inby equipment. Pipe rollers so far have been found the most convenient in moving drives over the soft bottom frequently encountered.

Two types of development units are employed at the No. 3 mine, Rail & River Coal Co. In driving main entries (four headings on 32-ft. centers, with the two inside motor-road openings 10 ft. wide and the outside aircourses 12 ft. wide), two shakers make up a unit and are moved from one side of the entry to the other. Room entries comprise three headings 12 ft. wide on 44-ft. centers, driven by three-shaker units with 90-L-22 elevating conveyors, 90-deg. turns, hoists and the necessary shortwall cutters and drills.

22 Shakers—4,000 Tons

A total of 22 G-20 shaker conveyors with A-3-H duckbills were accounting for a daily output of 4,000 tons (three shifts) at Rail & River No. 3. Two room units were in service, each comprising seven or eight shakers with duckbills, a 97-30 conveyor (30-in. U. S. Rubber belt) capable of extension to 960 ft., one Goodman 512 or 112-DA shortwall with 8-ft. bar and one 473 post drill per place, and a "Brownie" MKH-BF high-speed rewind car-pulling hoist capable of handling as high as 60 or more loaded cars at a time. The remaining six or eight shakers were being used in entry advancement.

Main-entry driving is shown diagrammatically in Fig. 3. Two shakers advance two of the headings 250 to 300 ft., driving a slant across at the end. The conveyors then are moved to the opposite side to advance the other two headings about the same distance and drive a slant. These slants facilitate installation of car-storage tracks, for which room is provided by always keeping one pair of headings ahead. Crosscuts are loaded out by hand in main-entry development.

In driving three-heading room entries, one shaker and the elevating conveyor are set in the center, discharging (Fig. 3) into cars on track turned through the crosscut. Conveyors advancing the side openings are brought through the crosscuts, which also serve as room necks, by means of 90-deg. turns. Crosscuts are made with 95-12 belt units. A remotely controlled hoist moves the cars past the elevating conveyor. A crew consists of nine facemen (three per place) and one man at the loading station. Average advance is two cuts per place per shift, each cut making about 20 tons. Drawslate is taken down and loaded out in all entry openings, both main and room.

Mother belt at Dorothy mine. The shaker drive in the background has just been set up in the crosscut. On the right is the sprinkler line.

Loading with duckbill under double planking in Rail & River No. 3 mine.

Rooms, as usual, are worked from the inside out, with the mother belt in the center heading and the shakers divided between the two sides—four on one, for example, with three or four on the other, as in Fig. 3. Rooms are necked 16 and widened to 26 ft. on 36-ft. centers. Depth is 300 ft. Squeeze blocks, made by omitting a room, are left between groups of six. Room necks are offset to keep shaker discharges apart. The two inside headings on the main (Fig. 3) are laid with heavy steel to facilitate changing trips. Empties come in one heading and are pulled past the belt discharge by the hoist. Loads go out through the slant, pulling the hoist rope back for coupling onto the new trip. Supplies come in on light track in the outside heading, this track going under the belt and up both sides of the room entry. Thus, supplies can be delivered to both sides of the room territory without crossing the belt, going through stoppings or curtains, etc.

With seven shakers, a room-unit crew usually comprises 21 facemen (three per place), seven timbermen (one per place), one man at the discharge end of the belt, a belt cleaner and a maintenance man. One belt greaser and one bit man work one shift each day in a section. A floating crew of six to seven men each shift recovers plank headers in worked-out rooms, resetting the posts for security, and brings out other material and equipment.

Loading machines develop for shaker equipment at Powhatan Point mine, Powhatan Mining Co., for greater speed

and flexibility and consequent lower cost under Powhatan Point conditions. Aside from this equipment (two 7-BU Joys, two 8-BU's and two Jeffrey L-400 track-mounted units), Powhatan Point was using ten G-12½ and ten G-20 shakers, all with duckbills. Loaders and shakers together averaged 6,512 tons per day of three shifts in May, with some 2,100 to 2,150 tons per day (18 machine shifts) from the loaders alone.

Loading Machines Develop

Headings are 11 to 12 ft. wide on 50-ft. centers. Number making up a main entry is six; cross, or face, entry, four; room entry, three. A development unit includes a loading machine, Jeffrey 35-BB shortwall cutter with 8½-ft. bar, Jeffrey A-6 post drill and 6-ton Baldwin-Westinghouse cable-reel locomotive. Crews comprise a loader operator, two cutters, driller, motorman, snapper, trackman and half a boss, and were averaging 118 tons of clean coal per shift. Track layout and general development are illustrated in Fig. 4, which shows the numerous slips and clay veins encountered. To keep pace with development and insure adherence to standard plans, the mine map is posted once a week. Drawslate in headings is shot down and loaded out, although outside headings in face entries may be widened as shown in Fig. 4 to permit gobbing at least part.

Rooms are worked retreating in groups of ten, with a solid pillar, or "squeeze block," between groups of five rooms on a side (Fig. 4). Room-unit equipment embraces ten G-12½ or G-20 shakers, each with duckbill, 97-30 conveyor (30-in. Boston Woven Hose belt) extensible to 1,350 ft., and "Brownie" HKD hoist, in addition to a 35-BB cutter and A-6 drill in each place. Joy "Catapullers" and crab locomotives are used for moving.

Showing steel H-beams set on jacks to hold the drawslate at the face in Powhatan Point mine. While cutting and drilling are carried on, loading of the coal at the left will be completed.

The crew with G-12½ equipment consists of 30 facemen (three per place), one boss, one mechanic, one "car topper," one laborer, who also greases the conveyor, and ten timber- and supplymen, averaging 700 tons of clean coal per shift. With the G-20 equipment, four facemen are used per place and twelve timber- and supplymen are employed. These crews were averaging 750 to 800 tons per shift.

Rooms are driven 30 ft. wide on 40-ft. centers 300 ft. deep despite a cover ranging from 300 to 600 ft. Neck width is 18 ft. Mother belts are installed in the center headings of room entries, with crosscuts opposite the room necks providing room for initial conveyor set-ups. As shown in Fig. 4, outer rooms in a group of five are kept ahead. Thus they are finished first and their conveyor units then are moved down five places, clearing the way for the rear units when they are worked out. Both middle headings on face entries are laid with heavy steel. The mother conveyor discharges to trips on the empty road, which then go out through a slant to the loaded road, pulling the hoist rope back to the loading point. For use during this period, a small auxiliary hoist is set near the conveyor discharge. Supplies are taken into the room sections via an auxiliary track in one outside heading.

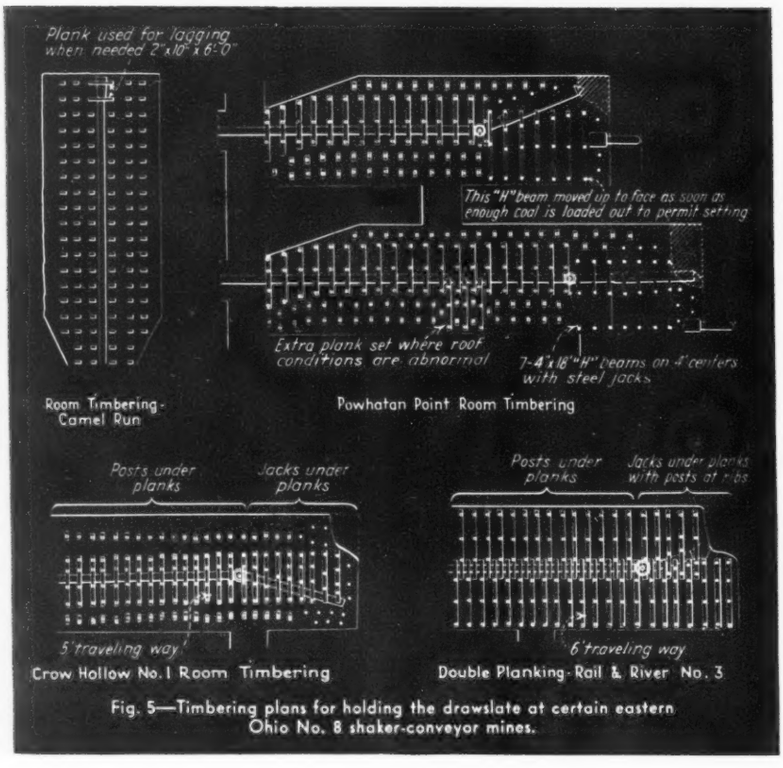

Plank used for lagging when needed 2"x10"x6'-0"
This "H" beam moved up to face as soon as enough coal is loaded out to permit setting
Extra plank set where roof conditions are abnormal
7-4"x18"#"H" beams on 4' centers with steel jacks
Room Timbering - Camel Run
Powhatan Point Room Timbering
Posts under planks
Jacks under planks
5' traveling way
Crow Hollow No. 1 Room Timbering
Posts under planks
Jacks under planks with posts at ribs
6' traveling way
Double Planking - Rail & River No. 3

Fig. 5—Timbering plans for holding the drawslate at certain eastern Ohio No. 8 shaker-conveyor mines.

Working Cycle Integrated

The working cycle at eastern Ohio No. 8 shaker-conveyor mines is based on interlocking cutting, drilling and other operations with loading so that the interval between producing periods is reduced to a minimum. Accordingly, separate timbermen are employed at some operations to relieve facemen of the responsibility for permanent posting and thus shorten the time they must spend in non-loading activities. In most cases, however, facemen do their own timbering, and sometimes also handle supplies.

At Camel Run and Witch Hazel mines, where shakers are hand-loaded and swivels are not used at the face, the cycle

might be said to begin with shooting the center of the cut. Five men work at the face in two places, with two in one place loading at this stage and the other three in the adjoining place taking care of cutting, drilling, etc., in addition to finishing loading. When the center is completed, the right rib is shot and loaded. During these and successive stages of mining a cut, posts, planks, and roof jacks hold the drawslate. When the right side is loaded, the left is shot. At this point, the right side is ready for starting the cutting and drilling cycle. At Camel Run and elsewhere, all other face operations stop during sumping.

Four Posts Set at Face

While cutting and drilling are being completed, other facemen extend the pan line, set timbers and do other work necessary, completing the timbering job when the cutting machine is pulled back and parked on the right. Thus, when the face is ready for shooting to start the new cycle at Camel Run, four posts with cap pieces and, if necessary, a 6-ft.-long plank over the loading pan, are set within 2 to 3 ft. of the coal. Four feet back is another plank and four posts, with six posts in rows 4 ft. apart from there on out, as shown in Fig. 5.

The Witch Hazel cycle is substantially similar to that at Camel Run, except that the three facemen assigned to each place do not work elsewhere, and the drawslate usually is taken down and gobbed after each cut is loaded. During loading, it is held in place as far as possible by roof jacks (seven per room). With the drawslate down, two rows of posts on each side of the conveyor have been found adequate when conditions are normal.

At mines using swivels at the face, with or without duckbills, the usual cycle consists of shooting and loading the center, then shooting the right rib and cleaning it out as soon as possible to let the cutting machine sump. The machine cuts across as far as possible while loading continues on the left, usually reaching a point about one-third to one-half over by the time it is completed. Cutting and drilling continue while men not engaged in this task extend permanent timbering, get the conveyor ready for extension and do other necessary work. Normally, the cutting machine, on its way back, is used to pull the pan line or duckbill ahead. With other operations completed, the center of the cut is shot to start the new cycle. In a few instances, as noted, special men extend permanent timbering, leaving temporary posting only to the facemen.

Since that part of the conveyor ahead of the swivel is moved back and forth in loading at Crow Hollow No. 1, Dorothy, Rail & River No. 3 and Powhatan point, Simplex or Duff-Norton jacks are used next to the face, with permanent posts back of the swivel. To hold the drawslate it usually is necessary to employ crossbars of some type to the face at these operations, although on occasion, as in the no-drawslate section at Dorothy, it is possible to use posts alone. In other Dorothy sections, however, 3x10-in.x16-ft. planks are used with jacks ahead of the swivel and four posts back of the swivel. Every other plank behind the swivel is accompanied by gob posts between the ends of the plank and the rib (places are 24 ft. wide).

Planks at Crow Hollow No. 1 usually are 3x12-in.x12 ft. in size, although some 3x8-in. material is in use. They are set on 3- to 3½-ft. centers approximately as shown in Fig. 5, with posts between the ends and the rib on each side. Posts also are set between planks at times to assist in their recovery. A travelingway about 5 ft. wide is left on the right by offsetting the planks the necessary distance from the center. Planks are used about three times, and recovery also includes posts.

Planks and posts are supplemented by 4-in. H-beams 18 ft. long, plus roof jacks, at the face at Powhatan Point. As indicated in Fig. 5, planks are installed over the conveyor back of the swivel, leaving a travelingway about 5 ft. wide on one side. Two rows of posts are set in the interval between planks on one side, with one row on the other. Seven steel H-beams are used ahead of the swivel, plus posts and roof jacks. These H-beams are installed on the side where the machine sumps in, since the men work largely in this area.

Double planking is employed at Rail & River No. 3 to take care of very bad drawslate conditions frequently encountered. Planks are set on 3½-ft. centers as shown in Fig. 5, using jacks ahead of the swivel, except along the rib, and posts behind. Planks are not less than 3 in. thick, the remainder of the cross-sectional area of 30 in. being made up in width. As soon as the center and right side are loaded out enough, a plank is set. When the rest of the coal is cleaned up, a second plank is set (Fig. 5). The same procedure is repeated on the left side. Until planks can be put up, roof jacks are used as required. When the swivel is moved forward, jacks under planks behind are replaced with posts, leaving a 6-ft.-wide travelingway on the right.

Mobile loading machines drive entries at Powhatan Point.

FACE PREPARATION

Eastern Ohio No. 8 Mechanical Mines

FACE PREPARATION in the eastern Ohio No. 8 field is characterized by track-mounted cutting and shearing equipment in two-thirds of the mobile-loader mines, all of which take down the charactertistic drawslate, and the universal employment of shortwall cutters in conveyor operations. At the latter, the usual practice is to hold the drawslate on timber in rooms and take it down only in headings, particularly those used for haulage.

Post-mounted drills predominate, although a few mines employ hand-held machines and some with post equipment use hand-held units in shooting drawslate. Permissible explosives or carbon dioxide, or a combination of the two, are used at most of the properties. Unless shearing is done, snubbing holes usually are drilled. The trend is toward longer cutter bars to increase tonnage per fall. A number of mines practice bit-tipping. One operation has installed a heat-treating plant.

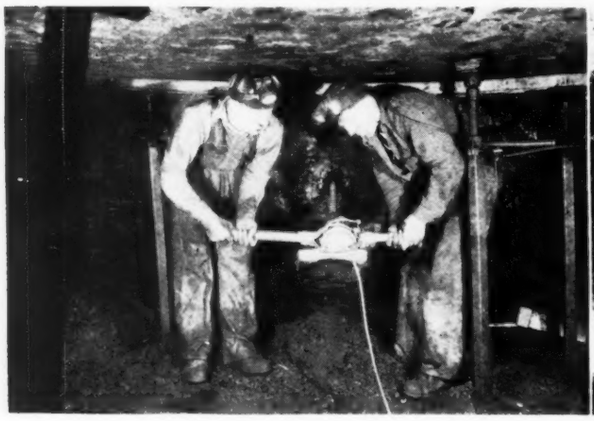
Average thickness of the No. 8 coal at the eleven mechanical mines covered in detail ranges from 56 to 64 in. Over the seam in all but local areas is about 12 in. of "stone," or drawslate, approximately 12 in. of "rider" coal and an average of 6 to 8 ft. of loose unconsolidated lime (Fig. 1, p. 61). Horsebacks, slips and rolls are frequent. Some thin bony partings are present, including a group of three near the middle of the seam in most localities.

Among the mobile-loader operations using shortwall equipment (50-hp. Goodman units with 7¾-ft. bars, Tracy chains and Warwood bits) is Mine No. 6, J. H. Somers Coal Co. Jeffrey A-7 hand drills are employed, with Warwood augers, and the coal is shot with 1¼x8-in. Austin pellet. Four holes, including a snubber to break the center, are drilled in a 24-ft.-wide room about as in Fig. 1. An additional three holes to break the drawslate are put in at the same time, but are not shot until after the coal is loaded. Three coal and two slate holes are drilled in 9-ft.-wide headings. Charges and tonnages per fall are given in Fig. 1.

With most of its mechanical output from rooms served by shuttle cars, Blaine mine, Lorain Coal & Dock Co., cuts with Jeffrey 35-B, BB or Goodman 12-DA shortwalls with 7½-ft. bars fitted with Warwood bits. In shuttle-car sections, the machines are moved on Joy T1-1E crawler-type trucks. Drilling is done with Chicago Pneumatic 473 post-mounted machines (Warwood augers and McLaughlin heads and bits). This past summer, the coal was broken down with 1¼x8-in. Liberty permissible running 140 sticks to the 50-lb. box. Cardox was used last winter for a higher coarse-coal yield and the mine probably will return to it this coming winter.

Rooms 24 ft. wide are broken with four holes, one a snubber just above the middle bands. Offset slightly from it is a top hole drilled to the drawslate to peel off the coal in this area. Two slate holes (Fig. 2) are drilled at the same time as the coal holes against later need in case the slate does not come down of its own accord. Typical permissible loading, shown in Fig. 2, averages eleven sticks (coal only). When Cardox is used, it is employed only in the top holes, retaining permissible for the snubber. Permissible is used at all times in driving headings, which are drilled with three coal and two slate holes (Fig. 2). As compared to rooms, where the drawslate is taken down and gobbed as soon as the coal is loaded, the slate is shot just before loading in headings, and then is pulled off the coal for deposition in a separate car or cars by the machine. Average sticks per heading place is ten, not including drawslate.

Cardox is used for safety, higher lump yield and improved loading conditions at the three mines of the Hanna Coal Co., including Piney Fork No. 1, closed for construction at the time of the *Coal Age* survey and therefore not covered in detail. Cutting and shearing at Piney Fork, however, is done by Jeffrey 29-U machines with 9-ft. bars and drilling by CP 473-BR post units. One 29-U machine also is in service at Dun Glen No. 11. The remainder are Oldroyds with 9-ft. bars using Cincinnati chains. A heat-treating plant had just been installed to provide a better bit for the difficult shearing service, requiring cutting through a hard layer in the top



Drilling a room face at the Witch Hazel mine.

Starting a room cut at Rail & River No. 3 mine.

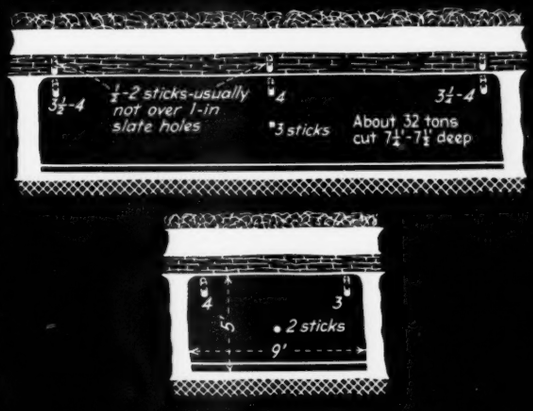


Fig. 1—Usual drilling patterns for rooms and headings, Mine No. 6.

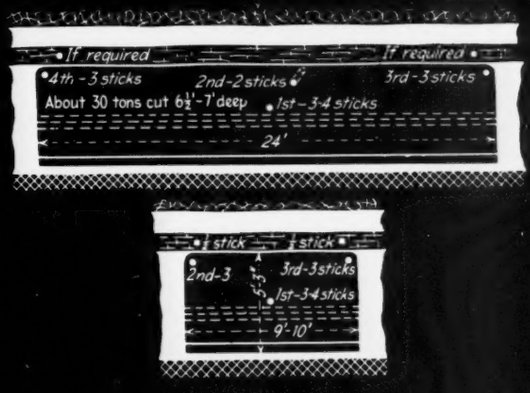
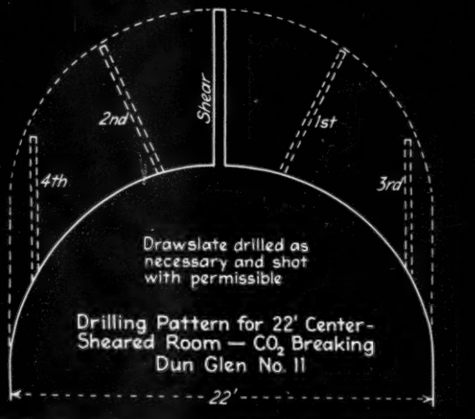
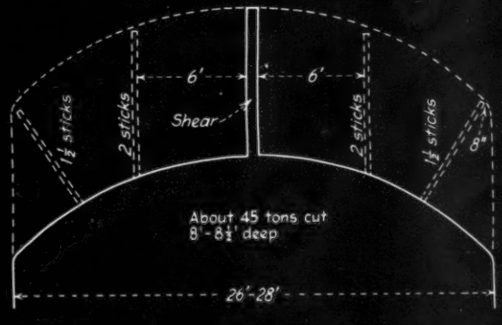
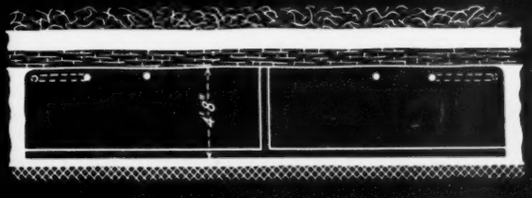


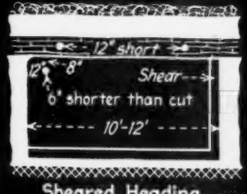
Fig. 2—Usual drilling patterns for rooms and headings, Blaine mine.



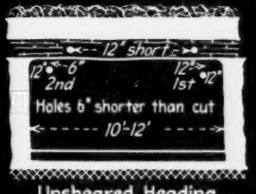


Breaking Coal and Slate Together with CO_2— Willow Grove No. 10



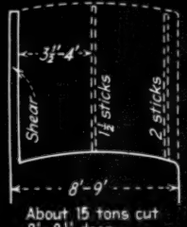


Sheared Heading
Willow Grove No. 10

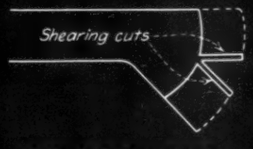


Unsheared Heading
Willow Grove No. 10

Fig. 3—Typical drilling patterns for coal, and coal and slate, Dun Glen No. 11 and Willow Grove No. 10 mines.

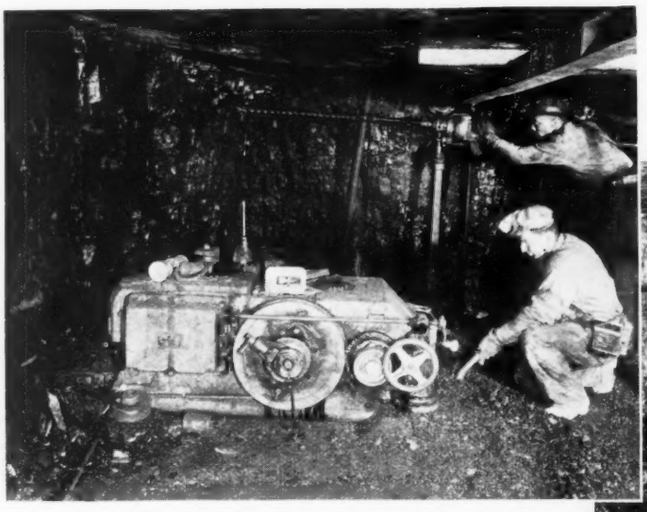


About 15 tons cut 8'-8½' deep



Method of Shearing to Protect Points in Necking Rooms on 45-Deg. Angle

Fig. 4—Usual drilling patterns for rooms and headings, Wheeling Township No. 2.

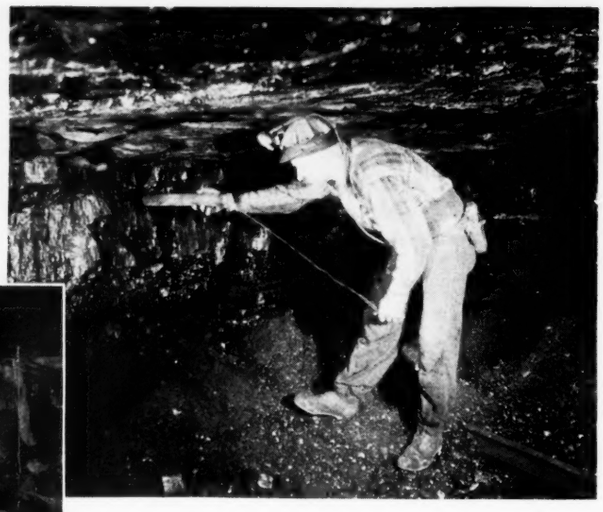


Cutting and drilling in a room in Powhatan Point mine.

Loading a snubbing shot with permissible in Dorothy mine, using cushion blasting.

Post drill in service in Blaine mine.

Placing carbon-dioxide tube in face hole, Dun Glen No. 11 mine.



Fall of coal and drawslate, both broken down with carbon dioxide, ready for loading in Willow Grove No. 10 mine.

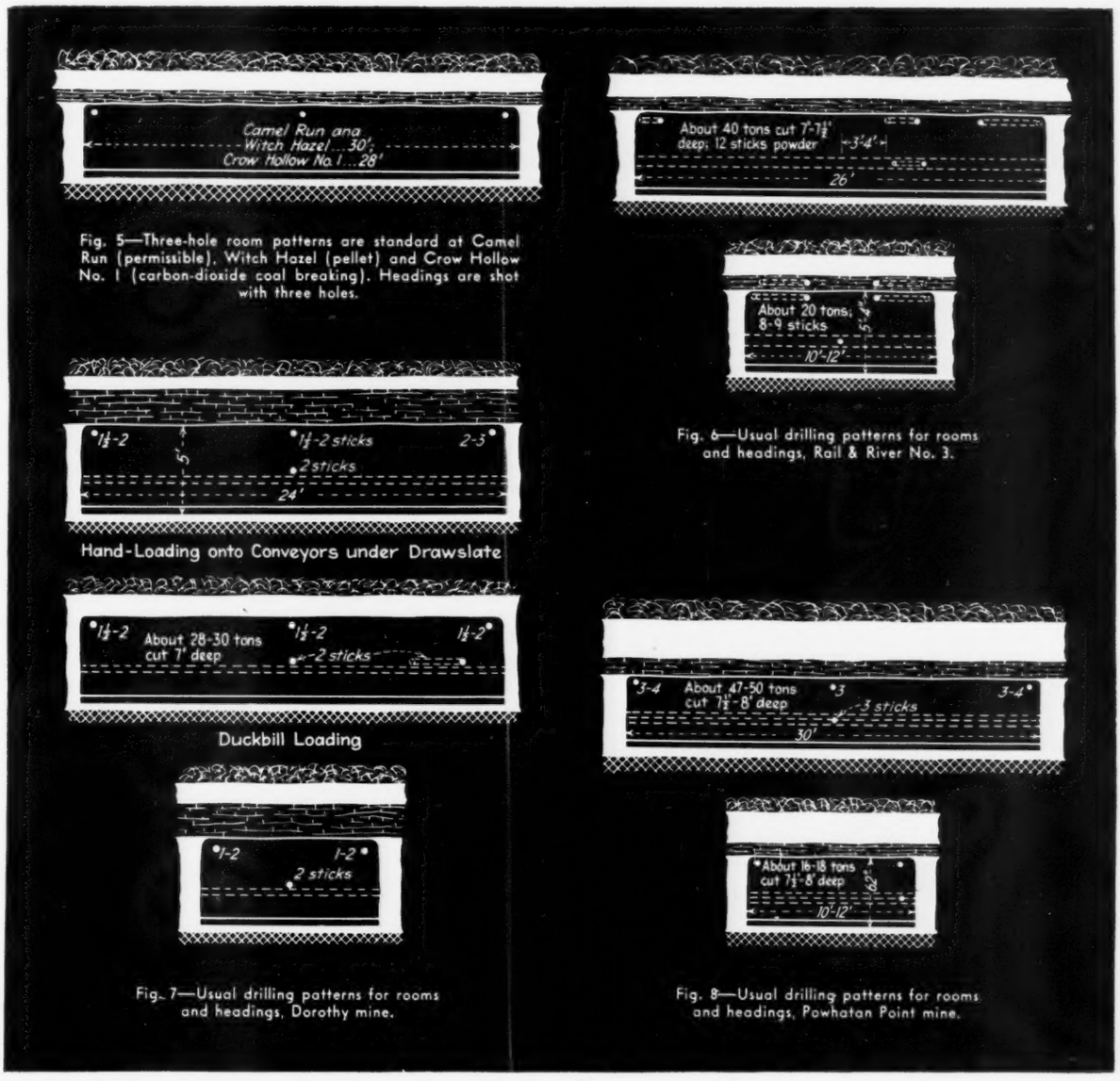


Fig. 5—Three-hole room patterns are standard at Camel Run (permissible), Witch Hazel (pellet) and Crow Hollow No. 1 (carbon-dioxide coal breaking). Headings are shot with three holes.

Fig. 6—Usual drilling patterns for rooms and headings, Rail & River No. 3.

Fig. 7—Usual drilling patterns for rooms and headings, Dorothy mine.

Fig. 8—Usual drilling patterns for rooms and headings, Powhatan Point mine.

and various bands at other points, as well as numerous rolls. CP 473 drills are in service, using Hardsocg sectional augers for coal and Coalmaster equipment for drilling drawslate when required. The coal is broken with Cardox 231-130 tubes (No. 12 disks) and the slate with 1½x6-in. du Pont Lump Coal C. As at most mobile-loader properties, the slate, or that part which does not come down with the coal, is taken down and gobbed after the fall is loaded. Holes are drilled where needed for this.

A room 22 ft. wide at Dun Glen No. 11 is sheared approximately in the center and is broken with four holes drilled from three set-ups about as in Fig. 2. The same plan is followed at Willow Grove No. 10, where Cardox, in addition to greater safety, increased the yield of plus 4-in. coal approximately 3 per cent in spite of higher friability than at most other properties in the district. However, Willow Grove breaks the drawslate down, also with Cardox, and loads it with the coal, and therefore three slate holes (Fig. 2) are drilled at the same time as the coal holes. When headings are sheared it is done on the right and one hole is drilled on the left, as indicated in Fig. 2. In unsheared headings, two holes, one slightly lower than the other, are employed. The drawslate is broken with two holes. Willow Grove cutting and shearing is handled by Oldroyd machines with 9-ft. bars; drilling by CP 472 and Jeffrey A-6 equipment; with some 471 units for slate. Hardsocg and Coalmaster augers are used.

Cutting and shearing at No. 2 mine, Wheeling Township Coal Mining Co., is handled by six Jeffrey 29-U track machines (one a spare) and two 29-U's on crawlers. One of the latter has been in service two years. All are equipped with 9-ft. bars. Bits are tipped after each use with Borod, which practice was instituted when the present cutting and shearing equipment was installed. Bit life was increased one-third over heat-treated bits formerly employed, in spite of the harder service accompanying shearing. Jeffrey A-6 post drills predominate, with a few CP 473 units for entries. Augers, bits and heads are McLaughlin. The coal-breaking medium is 1½x6-in. du Pont Lump Coal C.

Shear cuts are made in all places at Wheeling Township No. 2. Rooms are center-sheared, with side shears in headings, except those used for haulage, which are sheared on both sides. With the shear, a room 26 to 28 ft. wide is shot with four holes drilled as in Fig. 4. Two holes are used in single-sheared headings. Usual loading in rooms is seven sticks, with the maximum prescribed by the management as eight. Maximum loading in single-sheared headings is four sticks; usual, 3½.

Of the six shaker-conveyor operations,

all employing shortwall cutters, half drill three holes in rooms (Fig. 5) and two in headings 10 to 11 ft. wide. Goodman standard and universal machines with 7½-ft. bars and bits tipped each time with Borod are used at Camel Run mine, Warner Collieries Co., with CP 472-BR post machines (McLaughlin and Warwood augers) for drilling. The coal-breaking medium is 1¼x8-in. Herco F-1. A 30-ft.-wide room making about 40 tons is shot with ten to twelve sticks in the three holes. Headings require five to six sticks. Similar cutting equipment (untipped Warwood bits) is used at Witch Hazel mine, Florence Coal Co., except that bar length is 6½ ft. The coal is broken with du Pont pellet. An average of nine sticks is charged in the three holes in a 30-ft.-wide room making about 35 tons. Black & Decker hand-held drills (Warwood augers) are in service.

Cardox coal breaking was adopted when shaker conveyors were installed at Crow Hollow No. 1 mine, United States Coal Co., in October, 1940. One result was a 4 per cent increase in plus 5-in. coal. The 6-ft. bars on present shortwall equipment are being changed to 7½-ft., also the length on six Goodman 612-AB machines on order at the time of the *Coal Age* survey. Crow Hollow started tipping bits with Borod after each use about five years ago. Life of the point was increased about four times, raising output per set to about 65 tons. Present output is 1.55 tons per point, and bit cost is 0.69c. per ton. CP 473 drills with Hardsocg augers are employed in putting in the three holes in rooms and two in headings. Breaking is done with Cardox 2-100 and 2-80 tubes with No. 14 disks. A room 28 ft. wide makes about 30 tons when cut with a 6½-ft. bar.

Modified cushion blasting is practiced at Dorothy mine, Youghiogheny & Ohio Coal Co., where room-drilling plans are varied to suit the requirements of duckbill-equipped and hand-loaded conveyors. The coal is undercut with Jeffrey 35-B machines (Warwood bits tipped after each use with Borod) and drilled with Jeffrey A-6 post machines (Warwood augers with McLaughlin heads). The explosive is du Pont Lump Coal CC (5 oz. per 1¼x6-in. stick). Headings are shot with three holes (Fig. 7), one a snubber just above the middle bands. Four holes, including one snubber, are drilled in 24-ft. rooms served by hand-loaded conveyors. The usual charge (28 to 30 tons of coal) is eight sticks.

Snubber Drilled in Center

In rooms where duckbills are employed, five holes are drilled about as in Fig. 7, but the powder consumption remains about the same. One snubbing hole is put in over the bands in the center, with a second angled in from the right rib. Two sticks generally are loaded in each of these holes, which are designed to break the bands and roll out the lower part of the cut so that the ribs will roll in in turn, reducing powder consumption and easing the task of the duckbill. Holes in all cases are drilled 2 in. in diameter, as compared with a 1¼-in. stick diameter. In addition, the charges are pulled out about 1 ft. from the back ends of the top holes for additional cushioning effect.

With duckbill loading, snubbing shots also are used at Rail & River No. 3 mine, Rail & River Coal Co. Cutting is done with Goodman 512 and 112-DA shortwalls with 8-ft. bars (bits tipped with Borod after each use, increasing tons per point to 2). Holes are put in with CP 473 drills, augers and cutting heads. The breaking medium is Austin Red Diamond No. 3 L.F., running 150 1½x6-in. sticks per 50-lb. box. Once a week all power is cut off the mine and powder is hauled in by mule and stored in locked underground magazines.

Rooms 26 ft. wide and making about 40 tons are shot with four holes, one a snubber in the middle bands. Three of the holes are drilled from one set-up on the right and one from a second on the left, as indicated in Fig. 6. Usual loading is 12 sticks per room. In headings 10 to 12 ft. wide, the three coal holes (Fig. 6) are charged with 8 to 9 sticks. When the coal is loaded, two drawslate holes, drilled at the same time as the others, are shot with about two sticks each.

Using Jeffrey 35-BB cutters (8½-ft. bars and bits tipped with Borod after each use) and Jeffrey A-6 post drills supplemented by some CP equipment, including two 574-XC machines for clay veins (Hardsocg augers), Powhatan Point mine, Powhatan Mining Co., shoots with 1½x6-in. du Pont Lump Coal C running 150 to 155 sticks per 50-lb. box. A snubbing hole is drilled along one rib in headings, followed by two top holes, as shown in Fig. 8. Headings are advanced by track- or crawler-mounted loading machines. In rooms, where duckbills are used, one snubbing hole is drilled in the bands (Fig. 8), with three more in the top. Usual loading for a 30-ft.-wide place making 47 to 50 tons is 12 to 14 sticks.

Crawler-mounted cutting and shearing machine in operation at Wheeling Township No. 2 mine.

TRANSPORTATION

Eastern Ohio No. 8 Mechanical Mines

WORKING two and three shifts a day and hauling 1 to 5 miles, mechanized deep mines in the eastern Ohio No. 8 field use up to four locomotives in main-line service. Relay units are operated in all mobile-loader mines surveyed in Belmont, Harrison and Jefferson counties, and in the majority of the conveyor properties.

Mobile loaders, except at mines using shuttle cars, are served by 4- to 6-ton cable-reel locomotives. Since all the conveyor operations visited have installed mother equipment or use, as in entries, other means of bringing the coal to one loading point, trips usually are handled during loading with spotting hoists. A locomotive, however, occasionally serves entry-driving conveyors. Otherwise, they relay trips to main-line partings, although a few main-line units run to loading points.

Heavy steel is the rule. Main lines at the majority of the mines are laid on creosoted ties. Rail joints are welded at four properties. The usual roof support is steel crossbars, although Guniting was done at three mines and in certain locations in a fourth. Car size ranges from 3,000 lb. to 9 to 10 tons, with the trend in mobile-loader operations toward larger equipment. In conveyor operations, where cars are loaded in trips, most find existing smaller equipment adequate, although larger modern cars are under consideration in some instances. Anti-friction bearings predominate.

Main lines are mostly single-track, with passing tracks at mines using more than one haulage locomotive. Some properties, however, have double-tracked a portion, and one will double-track all heavy-steel routes. Dispatchers and telephones are employed at the larger operations and some have installed block signals and electric switchthrowers.

Shaft and slope operations studied include Powhatan Point mine, Powhatan Mining Co. Coal is hoisted by a Jeffrey skip installation (Vulcan stepped-drum hoist, 600-hp. motor). The timbered shaft is 108 ft. deep. Total hoisting distance is 172 ft. Skips weigh 10,100 lb. and, although their capacity is greater, present loading is two cars, or 5½ to 6 tons, of raw coal. Ropes are 1⅝-in. Gilmore. The bottom is protected by steel and concrete.

Rail & River No. 3 mine, Rail & River Coal Co., is served by a 12-deg. double-tracked 8x16-ft. slope 450 ft. long. Total vertical lift from bottom to dump in preparation plant is about 140 ft. The slope is Gunited and the two-track bottom, accommodating 90 empties and 90 loads, is protected by locust timber. Cars are handled on Pittsburgh Coal Washer Co. 1,100-ft. total-length chain hauls, one for loads and one for empties. The loaded chain, believed to be the largest in the world, is driven by a 150-hp. Westinghouse Type CW slip-ring motor. Each chain holds 16 cars running normally, and rate of delivery to the Phillips cross-over dump is three per minute. Cars weigh about 2,500 lb. and hold around 5,000 lb. Two auxiliary chain hauls on the bottom feed the main chains.

General Dip 1 Per Cent

Drift openings serve the remaining mines included in the *Coal Age* survey. General dip of the measures is around 1 per cent southeast. Although several operations haul uphill most or all the way, grades as steep as 3 or 4 per cent against the loads are few and short.

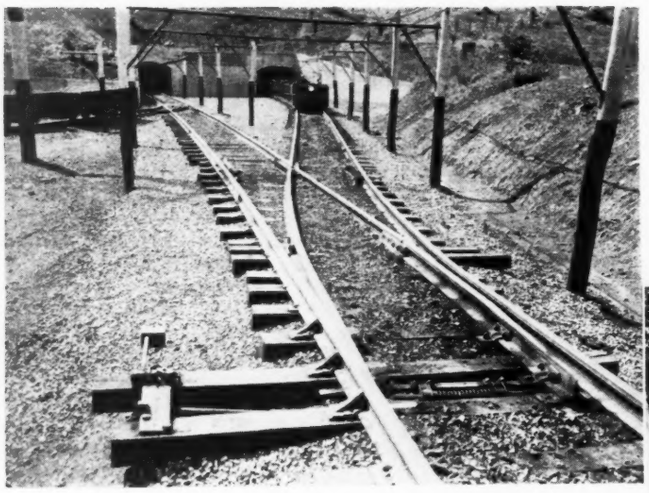
One 13-ton Goodman locomotive serves Camel Run mine, Warner Collieries Co., where Phillips end-dump cars (wood construction, Hyatt bearings) hold 2 tons. The main-line haul is 7,000 ft., including 1,500 ft. outside on a 4 per cent grade against the loads. Trips average 30 cars. The 60-lb. single-track main line is protected by steel-rail crossbars, lagged over the top, on regular-length posts or short legs hitched into the coal. On room entries, up to the mother-conveyor discharge, 40-lb. rail is used. Two 6-ton 2600-SM Goodman locomotives relay trips and do other work.

Sanford-Day drop-bottom cars holding 5,500 lb. (wood construction, Whitney "Wonder" wheels) are used at Witch Hazel mine, Florence Coal Co. The main-line haul (same general specifications as Camel Run) is about 5,500 ft. long (2,000 ft. outside). Haulage is handled by a 10-ton Goodman locomotive, with two 6-ton 30-B machines for relaying from the mother-conveyor discharge and miscellaneous service. Room entries, like Camel Run, are laid with 40-lb. rail on wood ties.

Crow Hollow No. 1 mine, United States Coal Co. (all conveyors), prepares coal on one shift only and stocks the other two shifts in mine cars. One 15-ton Westinghouse bar-steel locomotive hauls up to 70 cars per trip on the dumping shift. Stocking is handled by a 10-ton Westinghouse machine (25- to 30-car trips). Hauls range from 1½ to 2 miles. Maximum grade against the loads is 1½ per cent.

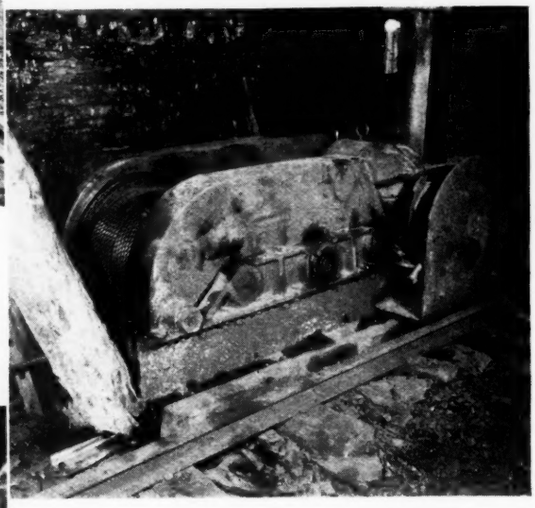
A single-track main line (4x6-in. Wood Preserving creosoted ties, slag ballast) serves Crow Hollow No. 1. Rail crossbars on present haulage roads are being replaced with Gunite. With a company machine, the cost is 10c. per square foot. Treated sections are gone over once a year and all cracks, bare spots, etc., are patched to insure maximum efficiency in support with low maintenance. Welding of 60-lb. rails by the "Airco" process (No. 22 manganese-bronze rod) was adopted two years ago. Only two joints have

On the main line at Powhatan Point—60-lb. rail on treated ties, with top taken to the solid limestone.



Main line in the new opening at the left at Wheeling Township No. 2 mine is laid with 60-lb. rail on creosoted ties. All rail joints in the track are welded.

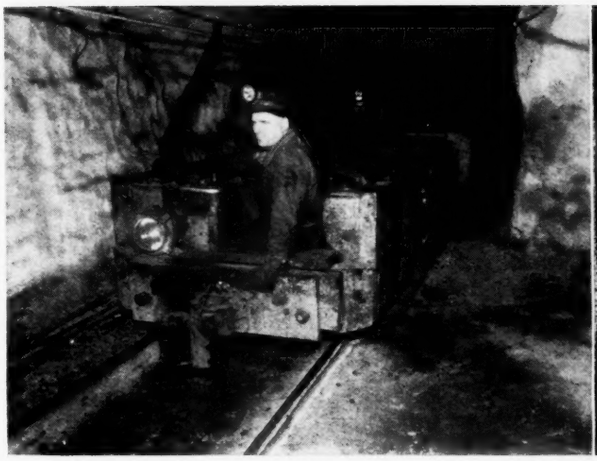
Car-pulling hoist in Rail & River No. 3 mine, one of many in eastern Ohio No. 8 conveyor mines.



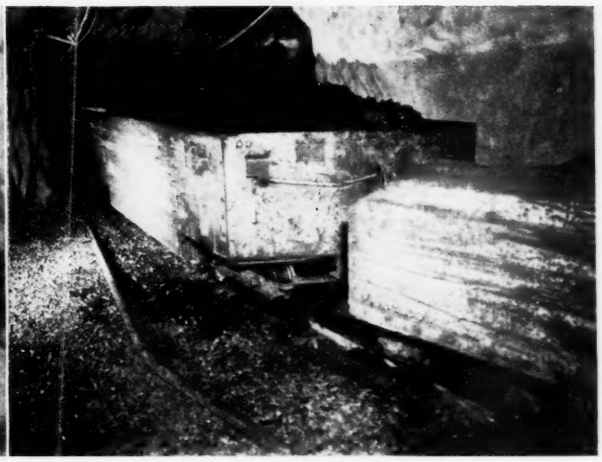
Steel-rail bars are the most common roof support along main lines. This view at J. H. Somers Mine No. 6 shows one of the common methods of eliminating timber legs.

One of several electric switch-throwers at Willow Grove No. 10.

Room-entry track at Willow Grove No. 10, showing the use of composite steel and treated-wood ties under the 40-lb. rail.



Haulage locomotive on the Dun Glen No. 11 main line, protected with Gunite.



Part of the new 225-cu.ft. car equipment in use at Dun Glen No. 11 mine.

broken. The cost of 185 joints (old rail) was $2.21 each; 174, $2.03 each; 200, $2.31 each. Water is kept off the haulage road by a 12-in. covered tile line to the outside.

Two Jeffrey 10-ton locomotives haul two miles from three sections to the dump at Dorothy mine, Youghiogheny & Ohio Coal Co. These locomotives normally operate to the two mother-conveyor discharges, and are supplemented by a 10-ton "jerry" unit. Five-ton Goodman 30-B cable-reel machines are used in entries and general service. Haulage roads, with passing tracks where needed, are laid with 40- and 60-lb. steel and protected by steel crossbars. Hockensmith wood cars with Hyatt bearings (2½ tons), Watt wood cars with Timken bearings (2½ tons) and Watt steel cars (3 tons) with Tyson bearings are used. Average cars per main-line trip is 50. Movement is controlled by dispatchers. Cars are dumped two at a time by a Heyl & Patterson rotary unit supplemented by two Streeter-Amet scales with printing recorders. Water along haulage roads is drained to sumps and pumped away.

60-Car Trips Hauled

One 6-wheel 15-ton Westinghouse locomotive hauls three miles at Rail & River No. 3, handling 60-car trips over short hills running as high as 4 per cent. A second 13-ton machine continues about one mile to a junction point, where the 10-ton locomotives serving the mother belts and entry-driving units exchange loads for empties.

Main lines are being relaid with 70-lb. steel on 5x7 Wood Preserving creosoted ties, adopted with slag ballast about three years ago. Two steel ties are used at each joint. Secondary routes are laid with 60- and 40-lb. steel, with 20-lb. on Bethlehem steel ties for supply tracks in conveyor sections. Nos. 4 and 5 frogs are used on the mains. Three-piece locust sets comprise the timbering. In addition to other drainage facilities a ditch has been dug for 3,000 ft. in from the bottom. Watt 4-ton steel cars (Timken bearings) are supplemented by 2-ton wood cars.

Haul to the four working sections at Powhatan Point is 3½ miles, and four 15-ton Baldwin-Westinghouse locomotives pull 40-car trips. Relaying, principally behind loading machines used for development, served by 6-ton cable-reel units, is handled by one 10- and one 15-ton Baldwin-Westinghouse. Wood and Kanawha steel cars (about 3 tons) are equipped with Timken bearings. Dispatchers control trip movement. In shaker-conveyor sections, main-line units normally operate to the mother conveyors. Consequently, 60-lb. steel is laid all the way, dropping to 40 just back of the development faces.

One mile of double- and two miles of single-track main line are in service. Plans call for complete double-tracking. Where the road is wet, 5x7-in. Wood Preserving creosoted ties are used; dry, 4x6. Wood and steel bars are used where necessary, although the top is being taken to the solid limestone 11 to 17 ft. over the coal, materially reducing top trouble and steel use.

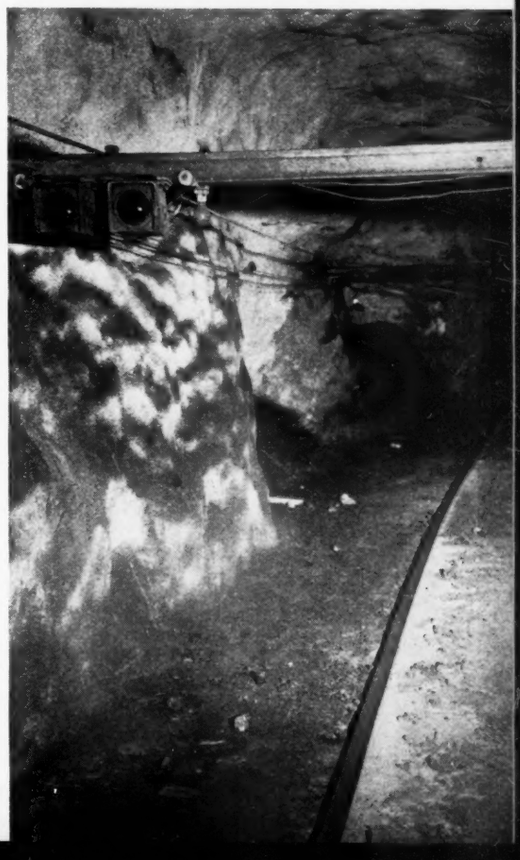
With the grade averaging 2 per cent against loads most of the distance, a 15-ton Jeffrey locomotive handles trips averaging 35 cars at Mine No. 6, J. H. Somers Coal Co. The present 1½-mile haul soon will be 2. Watt composite and wood end-dump cars (Timken and Hyatt bearings) hold about 2½ tons. Main lines are laid with 60-lb. steel. Where necessary, steel rail bars are hitched into the draw-slate over the coal. Working sections are laid with 25-lb. steel and 6-ton Jeffrey cable-reel locomotives serve the loading machines. No relay locomotives are employed.

Trips at Blaine mine, Lorain Coal & Dock Co., are limited to 70 cars and average 60. The Phillips end-dump cars hold 3,000 lb. Jeffrey 10- and 15-ton locomotives (one each) haul 8,000 and 10,200 ft. to the dump. Grades are light. One 10-ton relay locomotive serves principally 4-ton Jeffrey gathering locomotives behind loading machines in entry-driving. Trips are handled under elevating conveyors in two shuttle-car sections by additional 10-ton units.

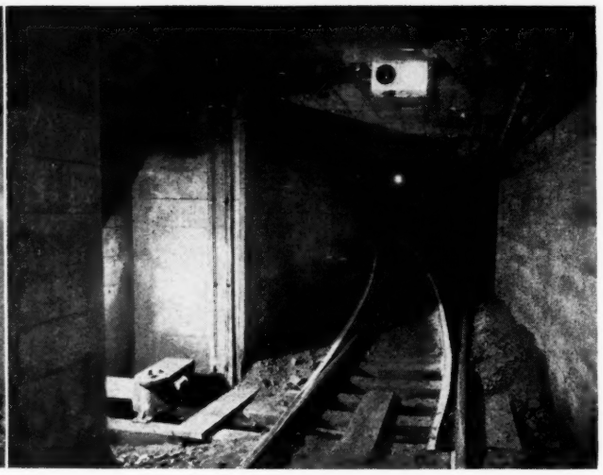
Blaine mine (dispatcher control) is double-tracked for 5,000 ft. Three Canton electric switchthrowers are used at important junction points. Main lines are laid with 56-lb. rail. The first creosoted ties were received June 6. Roof support consists of 70-lb.-rail bars (2-in. plank lagging) on 4-ft. centers set on short locust legs hitched into the ribs.

Main-line locomotives operate five miles to the working sections at No. 2 mine, Wheeling Township Coal Mining Co. Except in shuttle-car sections, loading ma-

Block signals supplement dispatcher control at Willow Grove No. 10 and Dun Glen No. 11



Bronze rail joints, Gunite and tile drain feature Crow Hollow No. 1 main line.



One of the electric switchthrowers employed at important points in Blaine mine.

chines are served by 4-ton Jeffrey cable-reel locomotives. Maximum grade against the loads on the main line is kept to 1 per cent and the average is ¾. One 10-ton and three 15-ton Jeffrey locomotives pull trips of 40 cars maximum. Watt and Irwin composite cars (mostly with Timken bearings) are in service. Capacities are 102 and 105 cu.ft. Usual loading is 2.95 tons.

Four passing tracks are established on the single-track main line (dispatcher control). Steel size is 90-lb. for 2,000 ft., with 60-lb. from there on. Ties (Wood Preserving creosote) are 5x7. In a new opening (West Virginia track materials) all rail joints are Thermit-welded. Secondary routes are laid with 40-lb. steel; room entries, 25-lb.; rooms, 25-lb. on Bethlehem steel ties.

Grading has included filling one stretch about 1,600 ft. long to a depth of 6 ft. Gunite was put on where the roof was shot. Elsewhere, 90-lb. rail bars on 3-ft. centers are used where needed. Water is drained to small sumps and pumped away.

One 20- and two 13-ton Jeffrey main-line locomotives are used at Piney Fork No. 1 mine, Hanna Coal Co., shut down for construction and therefore not studied in detail. Loading machines are served by 6-ton Jeffrey cable-reel locomotives, supplemented by two Goodman 30-B and two Ironton battery units. Main lines are laid with 60-lb. steel on 4x6 creosoted ties, slag ballast. Watt and Bethlehem steel cars hold 3 tons.

Hanna's Dun Glen No. 11 mine has been equipped with 145 Differential all-steel cars with a level-full capacity of 225 cu.ft. (approximately 8 tons). Features include "Axless" trucks on each corner, eight 10-in. "Naco" cast-steel wheels with Timken bearings, spring suspension and Willison automatic couplers. Car weight is 6,200 lb. Track gage is 42 in. The car body is 6 ft. wide and 15 ft. 5 in. long. Total length between pulling faces of couplers is 16 ft. 10 in. Height over the rail is 42 in. light and 40⅝ in. loaded. Dumping is handled by a Link-Belt rotary unit, supplemented by Toledo scales.

The haul at Dun Glen No. 11 (about two miles, 1½-per cent maximum grade against the loads) normally is handled in two stages by two 13-ton Goodman locomotives (25- to 30-car trips). Usual delivery to the dump is 250 to 275 cars of coal and 20 to 25 cars of rock per shift. Gathering is by 6-ton Jeffrey cable-reel equipment.

High-speed main-line locomotive at Willow Grove No. 10. Main-line standards include 60-lb. rail, creosoted ties and Gunite.

Treated Ties Installed

The single-track main line is laid with 60-lb. steel on 4x6 Wood Preserving creosoted ties (ash and slag ballast), with creosoted material for trolley supports, trestles, etc., on the outside. Room entries are laid with 40-lb. steel on Koppers "Ar-moored" ties (Bethlehem steel ties on creosoted wood base), and rooms with 30-lb. rails on steel ties. No. 6 frogs are used on main lines; No. 4 into panels and No. 2½ into rooms.

About 1⅜ miles of main line is protected by Gunite applied by the Gunite Construction Co. On other sections, steel bars on short legs recessed into the coal are employed where required. Water is drained to sumps and pumped out. Dispatcher traffic control is supplemented by "Nusco" (Nachod & U. S.) block signals.

One 16-ton Jeffrey and one 17-ton Differential "Axless" locomotives deliver 460 to 500 cars (4½ tons each) to the dump each shift at Hanna's Willow Grove No. 10 mine. The haul is 11,000 to 17,000 ft. Both locomotives do over 20 m.p.h. with a full trip of 30 to 40 cars on a main line graded to 1½ per cent or less. The "Axless" machine, installed in June, 1939, can do 30 m.p.h., but normally is kept at not over 20. Relaying is handled by 10- and 8-ton Jeffrey units; loader service, by 6-ton Jeffrey cable-reel equipment.

Cars comprise 167 Differential and 30 Watt 8-wheeled units designed for side-

dumping with Dongbeater equipment. Cars weigh 7,000 lb. and, as stated, hold 4½ tons. Some are fabricated of "Cor-Ten" and "Man-Ten" alloy. All include spring suspension and Willison automatic couplers. Use of 10-in. "Naco" cast-steel wheels (Timken roller or New Departure ball bearings) was started over three years ago and none has been lost to date.

Main lines are laid with 60-lb. rail on 4x6 Wood Preserving creosoted ties (ash ballast) except every fourth, a Carnegie steel tie. Thermit-welding of joints was adopted early in 1935, the cost at that time (old rail) running $5.75 per joint, compared with $4.09 for an angle-bar joint, complete with bonds, auxiliary return, etc. Maintenance on welded joints, however, has been practically nil and track conductivity was increased, in addition to smoother operation. Roof support on main lines (usually to the mouths of the room entries) is 1-in. Gunite (Gunite Construction Co.). Very few repairs have been required, although some Gunite has been in service eight years or more.

Room entries are laid with 40-lb. rail on "Ar-moored" ties. Steel ties and 30-lb. rail are used in rooms. "Ar-moored" tie use started in 1936 after earlier experiments with a 3x5-in. creosoted tie to which conventional steel-tie clips were riveted. At the end of 1937, the savings in labor and material involved in installation and recovery were reported to be 2¾c. per tie per month, as compared with the usual untreated tie in room entries.

Room entries and other subsidiary haulage roads not Gunited at Willow Grove are protected by 60- and 90-lb.-rail bars on short legs recessed in the ribs. Water is ditched to sumps and pumped out. Canton and Cheatham electric switch-throwers are used on all main turnouts, except where men are in attendance, and "Nusco" block signals are installed to supplement dispatcher control.

VENTILATION AND DRAINAGE

Eastern Ohio No. 8 Mechanical Mines

WITH new fans, new air shafts and better airways, ventilation at eastern Ohio No. 8 mechanical mines has undergone general rehabilitation in late years to insure ample air delivery at low cost. While most of the mines covered in the *Coal Age* survey are so dry that fresh water must be brought in for sprinkling, two drift operations handle substantial inflows and therefore have taken steps to do the job at minimum cost. Nine of the eleven mechanical mines studied in detail are drift operations, while two, on the Ohio River on the southeastern edge of the field, are served, respectively, by a chain-haul slope and a skip shaft.

Blowing fans are used in all cases and all are above ground. No boosters are in service and in only a very few operations do blowers and tubing find occasional use. Seam thickness averages 60 in. and the range is 40 to 70. Several feet of weak or soft material over the coal, which continues to break and fall if unsupported, presents an airway problem solved by timbering, machine loading of falls, and Guniting. General dip is about 1 per cent southeast.

Mines equipped with outlying airshafts and now profiting by the economies of one-way ventilation are: Willow Grove No. 10 and Dun Glen No. 11, Hanna Coal Co.; Blaine, Lorain Coal & Dock Co.; Powhatan Point shaft, Powhatan Mining Co.; Rail & River No. 3 slope, Rail & River Coal Co.; Mine No. 6, J. H. Somers Coal Co.; No. 2, Wheeling Township Coal Mining Co.; and Dorothy, Youghiogheny & Ohio Coal Co. Seven of these produce 3,000 to 6,500 tons per day. Most of the operations are considered non-gaseous, but methane is found in measurable proportions in the main returns at a few.

Using two Canton automatic doors, Blaine mine is operated with fresh air on the haulway. One door is at the drift portal, with the other 1,500 ft. inside, the two together forming an airlock. Two more similar doors are to be installed soon on 8th South to replace the plain doors forming another airlock. Powhatan Point also was engaged in converting the main haul from return to intake, using two Canton doors, one near the main shaft and another farther back to form the necessary airlock.

Overcasts Replace Doors

Few of the mines surveyed, however, have doors on the main haulway. Rail & River No. 3 has three, all for airlocks. Overcasts, the alternate for doors, are used at the other large mines. Of the six overcasts now in Powhatan Point, five were installed in the last two years, and plans are under way to install eight more. In Willow Grove No. 10, with eight overcasts in service, typical construction is based on concrete block walls supporting 90-lb. rails on 2½-ft. centers lagged between with 2-in. untreated oak and topped off with a 2-in. layer of Gunite. Two inches of the same material also is applied to the concrete walls and the roof of the overcast. Besides supporting the rock, Gunite smooths the surface and cuts air resistance.

An air shaft was sunk 5,000 ft. from the drift portal some years ago at Willow Grove No. 10, but, despite this move, changing conditions made another such opening advisable. This new shaft, 15,000 ft. from the portal, went into service in 1939 with a Robinson backward-curved blowing fan delivering 110,000 c.f.m. against a 2.9-in. water gage. Shaft depth is 105 ft.; size, 14x24 ft. It is lined with concrete and includes downcast, stairway and upcast compartments. The curtain wall, 4 in. thick and reinforced with two layers of wire, was built of Gunite blown against a 20-ft. form moved up in steps as the construction progressed. The wire is No. 6, 8-in. mesh, and the two layers are spaced 2 in. apart. In a few months, when 19th North and 19th South are worked out and sealed, the 150-hp. fan motor will be replaced with a 60-hp. unit. A 100-hp. motor now stands by as an emergency drive.

A 6-ft. Jeffrey Aerodyne fan was installed in 1938 at a 160-ft.-deep outlying shaft sunk in 1937 at Dorothy mine. In this two-compartment concrete-lined shaft, the curtain wall also is of the same material, 9 in. thick. Fan delivery now is 110,000 c.f.m. against a 2½-in. water gage. In addition to driving the fan, the motor, a Westinghouse 4,000-volt 75-hp. synchronous unit with Westinghouse magnetic control, also takes a leading current from the line and thus corrects the power factor of the mine load.

To ventilate a new opening now being developed at Wheeling Township No. 2 mine, a 5-ft. Aerodyne fan with 75-hp. two-speed induction motor is installed at the portal close by the drift entrance to the old mine. The latter is ventilated (56,000 c.f.m. at 2½-in. w.g.) by a 3x5-ft. Jeffrey centrifugal.

Ventilation at Powhatan Point was improved in 1939 and power requirements were cut from 200 to 43 hp. by installing a 5-ft. Aerodyne fan at a new air shaft on Cats Run 2.8 miles from the hoisting shaft. This fan delivers 90,000 c.f.m. at 3¼-in. w.g. Within 200 ft. of the fan shaft, which is 100 ft. deep, another shaft, 103 ft. deep has been sunk to serve as an upcast. It is round, 12 ft. inside diameter, and concrete-lined.

Water gage was reduced from 5¼ to 2¼ in. at Blaine mine when a new air shaft was sunk in 1940. It is 10x30 ft. in size and 64 ft. deep, with provision for future installation of a curtain wall and new fan. The present fan, a 4x6-ft. centrifugal near the main portal, is driven through ten 1⅛-in. "Vulco-Rope" V-belts by a two-speed Fairbanks-Morse ball-bearing 440-volt motor.

Rail & River No. 3 is served by an outlying air shaft 45 ft. deep where a Robinson backward-curve fan with a two-speed Westinghouse motor was installed in 1937. This fan now delivers 70,000 c.f.m. at 3.4-in. w.g.

Three main splits is the usual set-up at the larger mines. Length of the longest splits varies from 7,500 to 22,000 ft.

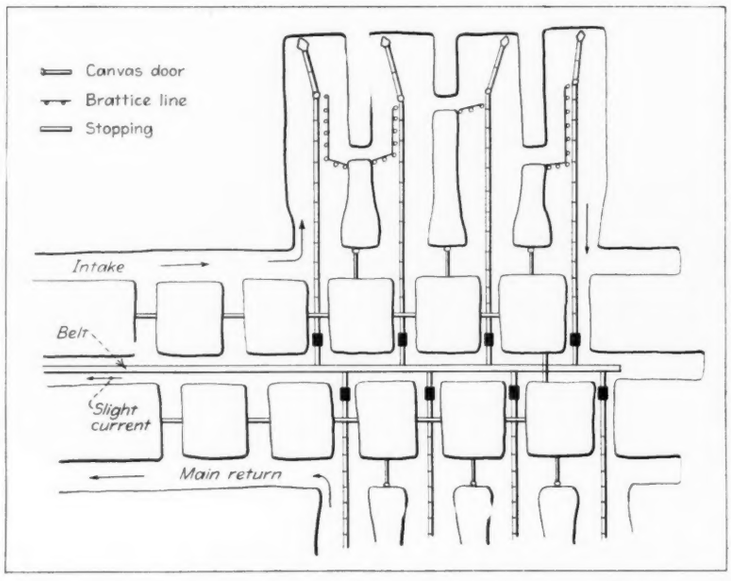


Fig. 1—Line brattices are used in all rooms, with canvas doors on the headings, at Rail & River No. 3 conveyor mine.

Automatic door at the Blaine drift portal, one of two forming an airlock.

Two of the larger mines, at the time of the survey, were operated without main splits and air travels were 39,000 ft. and 52,000 ft.

Three-heading main entries are driven at Willow Grove No. 10, Dun Glen No. 11, Dorothy and Camel Run, Warner Collieries Co. Willow Grove formerly drove six-heading mains but since has dropped back to three on the premise that the smaller number, carefully maintained and kept open, are better than six with the top not protected against falling. Main haulways are Gunited and in the new aircourses 10 to 14 ft. of the top rock is taken to the solid limestone to increase area and eliminate falls. Some 1.6 miles of haulway is Gunited at Dun Glen No. 11, where aircourses usually are tracked with scrap materials to facilitate loading out falls.

Wheeling Township drives four-heading mains, but, as at Willow Grove and Dun Glen, also mobile-loader operations, room entries are made up of two headings. Using mobile loaders to develop for shaker conveyors, Powhatan Point drives six-heading main, four-heading face, and three-heading room entries. Mains at Rail & River No. 3, shakers exclusively, comprise four headings (three for room entries). The characteristic drawslate, or "stone," is held in airways by lagged crossbars supported on posts along the ribs and in the center. Locust timber is used and its lasting qualities are such that no falls have occurred.

To reduce the travel of dust along the belts the center headings of the room entries in Rail & River No. 3 and other shaker operations using mother belts, air is kept out by closing crosscuts and other openings. Curtains, doors and brattice lines are used to insure ventilation of the working faces. Rail & River No. 3, for example, uses canvas doors on the headings on each side to start the air up the rooms (Fig. 1), finishing the job with line brattices from the last room crosscuts to within 25 ft. or closer to the face.

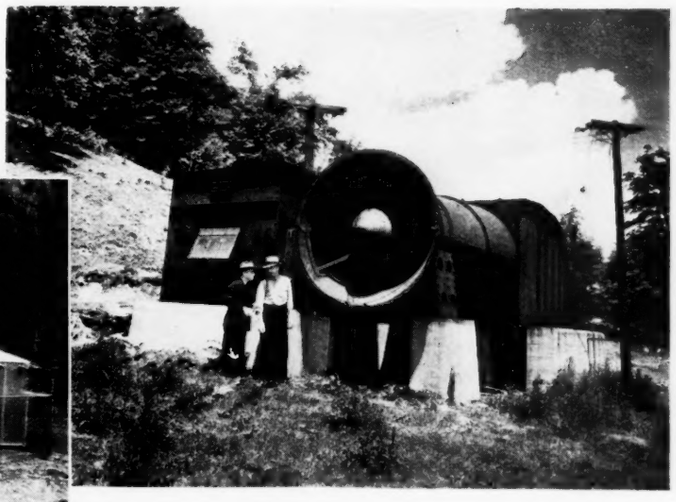
Face entries to open up new sections are made up of four headings at Blaine mine, with three headings making up room entries (shuttle-car service). The top eventually falls to the solid limestone in entries. Cleaning up is done by laying temporary track and using a Myers-Whaley shovel. Number of headings making up entries at Crow Hollow No. 1 mine, United States Coal Co., has been increased from two to three and plans are under way for full-retreat operation. Haulways are being Gunited. The top is held by timber in airways.

Reopening Cuts Power

Reopening an old entry to an existing air shaft at Mine No. 6, J. H. Somers Coal Co., made it possible to replace the 50-hp. fan motor with a 20-hp. unit. Reopening was done by driving over top of the old entry for 800 ft. Track was laid on the fallen material and 800 cars of rock were loaded with a Joy machine in taking the remaining top to the limestone. Total air travel is now 2 miles instead of 4 and the water gage in 1½ in. instead of 3. Of the 36,000 c.f.m. produced by a centrifugal fan near the tipple, 19,000 c.f.m. leaves via the air shaft and the rest comes out the main return. A door at the portal permits making the main haulway the fresh-air intake.

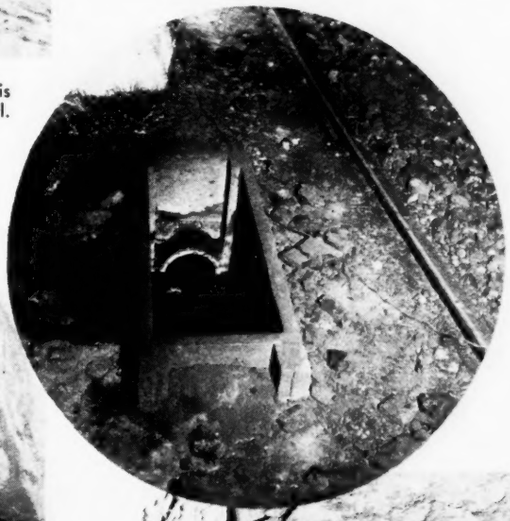
Two mines are sealing worked-out panels. This practice was adopted a year ago at Willow Grove No. 10, where the seals are hitched into the bottom 18 to 24 in. and into the ribs 12 in. The top on each side of a seal is held with steel crossbars on locust posts. Seal construction comprises two tiers of bricks

This 6-ft. fan at the new outlying air shaft at Dorothy mine is driven by a motor which corrects the power factor.



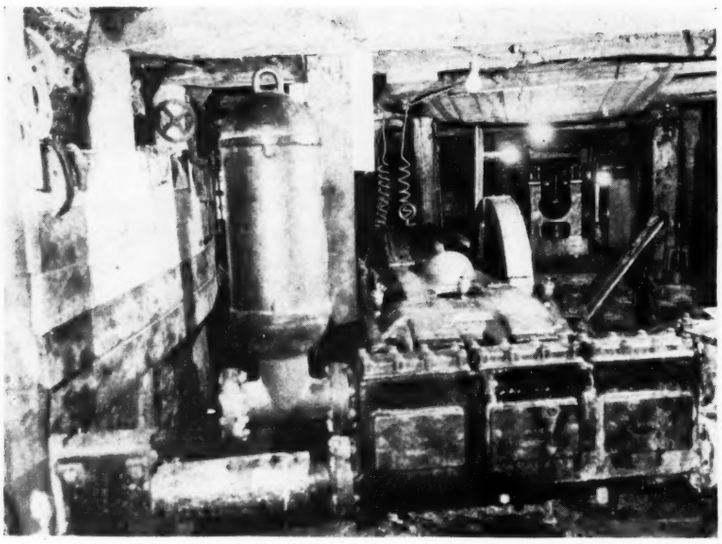
Willow Grove ventilation was improved in 1939 by this new fan and air shaft 15,000 ft. from the mine portal.

Clean-out box in the 12-in. tile drain on the haulway in the Crow Hollow No. 1 mine.



This overcast in Willow Grove No. 10 has a Gunite covering over the top, with the same material on the rock of the arch.

Two airways, such as the one shown here with top taken to the solid limestone, offer less air resistance than the five without effective top control formerly driven for use at the Willow Grove No. 10 property.



This triplex horizontal pump in a two-unit station on the Rail & River No. 3 slope bottom has been fitted with a chromium-alloy water end.

and one of concrete blocks, with plaster on the latter. Work now is under way on twelve seals to cut circulation off the 19th North and 19th South sections, where mining soon will be completed. These seals will be built of brick 18 in. thick, hitched 2 ft. in the bottom and 3 ft. in the ribs. Height to the solid limestone will be as much as 14 ft. Test pipes and valves are put in all seals.

Panels of 36 rooms, 18 on a side, are sealed as soon as completed at Rail & River No. 3. The three seals required are hitched to the solid and consist of two tiers of bricks and one tier of concrete blocks. Seals are equipped with test pipes and valves.

Permanent stoppings in most of the mines studied are built of concrete blocks. Exceptions are Blaine and Witch Hazel mine, Florence Coal Co., where brick is used. Temporary stoppings are of wood and few are plastered. None of the seals or stoppings is built to withstand water pressure.

Mine-drainage cost at several mines is less than 0.01c. per ton, but ranges up to 2½c. at others. In most, the water is corrosive—highly so if allowed to stand. Two mines studied are classed as "wet," but the others are comparatively dry.

One of the wet ones is Wheeling Township No. 2, where all pumps are acid-resisting bronze. Ten pumps gather and three deliver to the outside. All of the gatherers are Myers No. 615 "Bulldozer" and Murray 5x8 wood units with oil-splash crankcases driven by 5-hp. d.c. motors. Each main station has one Weinman 350-g.p.m. centrifugal driven by a d.c. motor. Sizes are 15, 20 and 30 hp. To eliminate priming, all three pumps are set below sump level. Float switches operating Ohio Brass starters effect automatic starting and stopping. One pump discharges through 4,000 ft. of Wyckoff 4-in. wood pipe to the drift portal and the other two through boreholes, one 80 and the other 135 ft. deep. Considerable water finds its way onto the main haulway and is removed by ditching to sumps.

Boreholes Drain Workings

Although Crow Hollow No. 1 is very wet, special drainage means leave but four pumps in use (reciprocating units driven by 7½- and 10-hp. 550-volt d.c. motors controlled by Ohio Brass KSD automatic starters). The water is so highly corrosive that brass valves and seats lasted only two weeks. Now, liners, seats and valves are chromium-nickel alloy (Penn Machine Co.), and these have a very long life. For the 2-, 3- and 6-in. pipe lines, American Hard Rubber connections, nipples and valves are used.

Elimination of pumps and long pipe lines at Crow Hollow No. 1 is accomplished by drilling horizontal holes through barrier pillars and unmined crop areas to effect natural drainage to the outside or to a worked-out area, or to provide a short cut for a pump line. The holes are made with a motor-driven drill developed at the mine and able to bore 5-in. holes 460 ft. through the coal without difficulty. Water pumped through

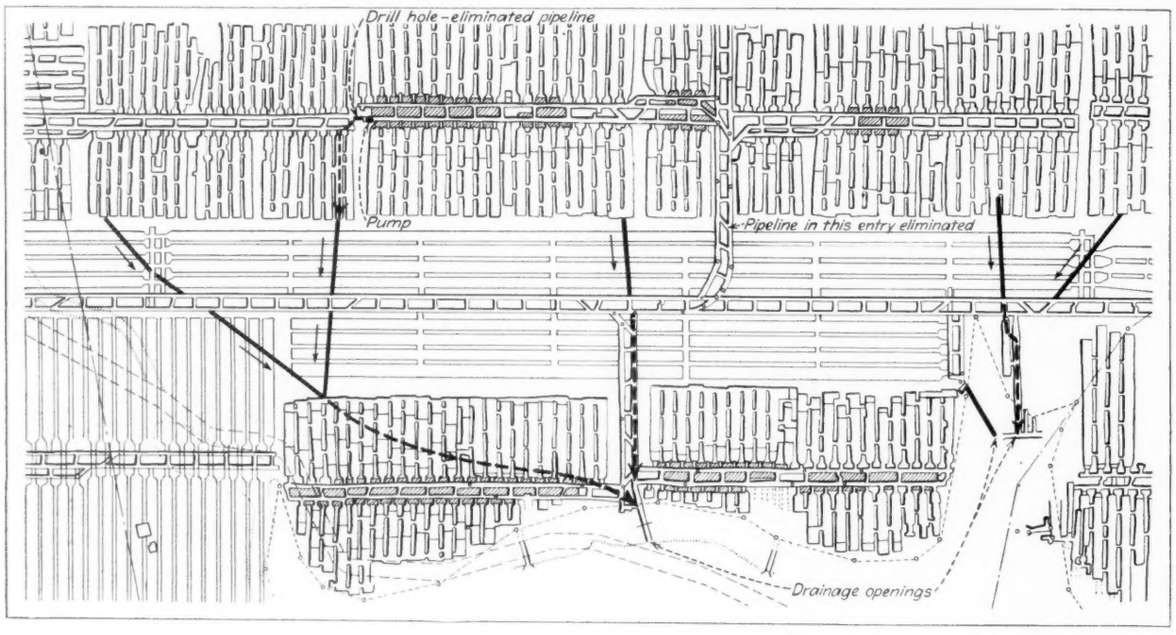


Fig. 2—Part of the Crow Hollow No. 1 workings, showing drainage holes.

the drill rods and hollow auger washes the cuttings back through the hole.

The first two holes eliminated four pumps with motor totaling 27½ hp. and the wages of one pumper. Thirty-eight drainage holes totaling 7,560 ft. have been drilled. The main haulway is drained to the drift portal by 12-in. tile with access or clean-out boxes every 200 ft.

Seven Deming 5x5-in. pumps are in service in Mine No. 6, J. H. Somers Coal Co. To counteract acid water, one pump is Duraloy and the others have special bronze water ends with stainless-steel rods. What little water seeps into Rail & River No. 3 mine also is strongly acid. Delivering to the outside is one 50-g.p.m. pump at the air shaft and two Deming 7x8-in. triplex pumps at the bottom of the slope. One triplex was fitted with a new chromium-alloy acid-resisting water end in 1937. A 6-in. Wyckoff discharge line runs up the slope from this pumping station. All valves in the mine are wood construction.

Powhatan Point (6,500 tons per three-shift day) has two stations delivering water outside. A plunger unit rated 100 g.p.m. at the bottom of Cats Run air shaft operates 5 hours per day. The other, a 300-g.p.m. centrifugal at a borehole near the tipple, works 10 hours per day. Both pumps are acid-resisting and the borehole discharge pipe is steel with a concrete lining; gathering pumps not needed.

Seven gathering pumps and two main pumps discharging to the outside handle water at Dorothy. The largest is a 7x8-in. plunger unit. New water is somewhat corrosive and that coming from the old workings is highly so. A 4-in. American Hard Rubber siphon line installed in 1929 still is in excellent condition. Other corrosion-resisting lines in the mine are a 1,000-ft. stretch of 3-in. American cement-lined cast-iron pipe and 7,000 ft. of 4-in. Wyckoff wood along the main haulage.

Seven small reciprocating pumps in Dun Glen No. 11 mine deliver through the drift portal. Five are equipped with Ohio Brass Type DRF starters and two, float-switch controlled, have Type AD starters. Johns-Manville "Transite" discharge pipe is laid along a section of the main haulway. In Willow Grove No. 10, a comparatively dry mine but not as dry as Dun Glen No. 11, 1,000 ft. of Transite, part suction and part discharge, serves a pump near the pit mouth. Perhaps the dryest of the mines surveyed is Blaine, with one small pump operating only two hours per day, delivering to the outside.

ELECTRIFICATION

Eastern Ohio No. 8 Mechanical Mines

ADEQUATE and efficiently transmitted power, properly controlled and protected, is an outstanding feature of the rapid growth of mechanical mining in the eastern Ohio No. 8 field. Portable motor-generator and rectifier substations are included in the facilities supplying direct current. Equipment at the various operations, producing 700 to 6,500 tons per day, includes mobile loaders served by mine and shuttle cars, and hand- or self-loaded shaker conveyors, usually with mother belts.

Nine of the eleven mines covered in the power survey are drift operations. One is served by a skip hoist and another by a 12-deg. slope (540-ft.-long chain car haul). Dip of the seam is about 1 per cent southeast. Thickness ranges from 40 to 70 and averages about 60 in. Three-shift operation of underground equipment at nearly all operations, with two shifts at the remainder, in conjunction with the favorable natural conditions, results in low power consumption per ton of clean coal shipped.

All mines but that of the Wheeling Township Coal Mining Co., which generates its own power, use Ohio Power Co. service. Distribution voltage, except for 2,300 at the Powhatan Mining Co., in most cases is nominally 4,150 volts. The Wheeling Township power plant, including two 500-kw. Allis-Chalmers turbo-generators and built in 1934 (*Coal Age*, March, 1935, p. 115), supplies approximately 600,000 kw.-hr. per month (5.24 kw.-hr. per ton of coal shipped). Fuel, which includes crushed pickings, averages 12,500 B.t.u. Consumption is 3.54 lb. per kilowatt-hour. Steam is generated by two Babcock & Wilcox water-tube boilers fired by B. & W. chain-grate stokers. The plant recently was improved by adding Copes feed-water regulators, Hagan automatic combustion control and an additional circulating pump so that each condenser now has its separate unit.

Investment in the plant building is small. Except for brick walls at each end of the engine room, the construction, including the stack, is steel. The plant is 2,000 ft. from the tipple and within 250 ft. of the portal. An adjacent dam impounds 3,500,000 gal. of surface water and the near end of this pond is equipped with condenser water cooling sprays. Power factor of the plant load is kept at 100 per cent by overexcitation of substation motor-generators.

Power factors at the other mines surveyed average 98.5. Several of the smaller mines without mechanical cleaning and operating few or no induction motors maintain 100 per cent with correction supplied only by substation motor-generators. The relatively high power factor possible with synchronous converters is indicated by a 97-per-cent average at Crow Hollow No. 1 mine, United States Coal Co., using no synchronous motors or capacitors.

At Dun Glen No. 11 mine, Hanna Coal Co., with a large induction motor load in the preparation plant and two 300-kw. 275-volt rectifiers underground, a 300-kva. Westinghouse capacitor raised the power factor 2½ per cent to an average of 97. This installation is outdoors near a fan and air shaft and consists of two ground-mounted cabinets, one containing eight 15-kva. units and the other twelve.

When a new fan was installed in 1938 at the top of a new air shaft at Dorothy mine, Youghiogheny & Ohio Coal Co., an 0.8-power-factor Westinghouse synchronous motor was selected for the drive to provide power-factor correction. This motor (75 hp., 4,000 volts, 900 r.p.m., 10 excitation amp.) is supplemented by a Class 14-250 magnetic controller.

At Powhatan Point mine, Powhatan Mining Co. (6,500 tons per day), average power factor is maintained at 100 by a synchronous condenser in a building near the preparation plant (562-hp. connected induction motor load). Until 1939, when ventilation was revised to greatly reduce power requirements, the correction unit, a General Electric synchronous motor (200 hp., 2,300 volts, 720 r.p.m., 0.8 p.f.), drove an old centrifugal fan. One drive taking a lagging current at Powhatan Point is a 600-hp. General Electric wound-rotor induction motor driving a Vulcan

Wheeling Township power plant.

shaft hoist. Another inductive load, close to the preparation plant, is a 100-hp. motor on a hoist on a man-and-supply slope.

At completely mechanized No. 8 mines, power purchased or generated per ton of coal shipped averages 4.7 kw.-hr. In some cases, contrary to usual expectations, a lower power cost has followed mechanical mining. Consumption at Powhatan Point, for example, now is 4.75 kw.-hr. per ton shipped (conveyors with duckbills in wide work and mobile loaders in development), compared to 8½ when the mine was on hand loading. Three-shift operation, increased production, more efficient a.c.-d.c. conversion, lowered transmission and distribution losses and a new ventilating system are contributing factors.

Transmission loss was lowered and voltage improved at Powhatan Point by installing, in the mine yard at the main shaft, a 1,000-kva. General Electric three-phase auto-transformer to boost the voltage from 2,300 to 4,150 in sending power to an air shaft where a fan and a d.c. outside substation are situated.

Although the main-line haul is 4½ miles from mother-belt loading station to slope bottom, consumption at the Rail & River Coal Co. No. 3 mine is only 2.3 kw.-hr. per ton. All coal is loaded with duckbills and one of two d.c. substations is an Ignitron rectifier. Pumping load is almost nil. On the other hand, the mine makes gas and is served by a 12-deg. slope (540-ft.-long chain car haul), which factors normally tend to increase energy use. The tipple load is small.

Four of the 43 substation conversion units at the mines covered are portable 275-volt Ignitron mercury-arc rectifiers. Other units comprise 26 synchronous converters and 13 synchronous motor-generators. Of the 27 substations in service, 13 are outside and 14 underground. The typical pattern is one substation above ground near the tipple and the rest below, although the four smallest mines have none underground. At the larger mines the typical set-up is three substations underground. However, Powhatan Point, the largest, has only one below, but at the same time it is one of only two operations with a substation at the top of a borehole or shaft near the working territory. The other is Mine No. 6, J. H. Somers Coal Co.

Three Westinghouse Ignitron single-unit portable substations are used underground at Hanna mines. Two are at Dun Glen No. 11 and one of these is a sealed-type machine installed in 1940. Lower first cost, fewer moving parts and a starting time of 6 minutes from cold are reported advantages of the sealed type. If the a.c. supply is off less than 10 minutes there is no difference in starting time for the two types but if the outage is 1½ to 2 hours the pumped rectifier requires 40 minutes.

Two of three underground substations in Hanna's Willow Grove No. 10 mine are portable and full automatic—the rectifier and a Westinghouse 400-kw. motor-generator. Total d.c. substation capacity is 1,500 kw. Production is 4,500 tons per day of three shifts. Dun Glen capacity is 1,350 kw.; three-shift production, 3,950 tons. Portables are installed at locations comparatively free of dust and where air circulation is 250 to 300 c.f.m. The Willow Grove rectifier substation is in a chute through a 40-ft. pillar. The floor is concrete and the walls and ceiling Gunite on coal or rock. An 18-in. pipe brings air to the center of the unit from an adjacent intake. The three trucks in operating position require 30 ft. of track.

Two Rectifiers Serve Mine

The pumped rectifier in Dun Glen No. 11 mine was 2 miles in from the drift portal at the time of the *Coal Age* survey and was protected by steel posts, steel crossbars and corrugated galvanized lagging. It was soon to be moved to a point 9,000 ft. farther in. The sealed unit is in a Gunited slant cut through a pillar at a junction on the main haulway. All three Hanna rectifiers have Westinghouse Inerteen-filled transformers.

The Rail & River No. 3 Ignitron rectifier is a General Electric unit with Pyranol-filled transformers. At present, this portable unit, on three trucks, is in use outside at the slope portal. When it will be placed underground depends on mine development. Now operating in parallel with the rectifier and four miles distant underground are two Westinghouse 300-kw. motor-generator sets with d.c. voltage adjusted to 285. Substation voltage adjustments of 290 are not uncommon in eastern Ohio and an outside installation at Willow Grove No. 10 is adjusted to 308 volts.

An I.T.E. load distributor is used on a portable substation 21,600 ft. in from the drift portal in Wheeling Township No. 2 mine. This portable (General Electric 400-kw. motor-generator with Westinghouse full-automatic control) operates in parallel with two 200-kw. converter substations underground and one 300-kw. motor-generator on the outside. The first converter substation is 3,000 ft. outby the portable set and the second is 4,600 ft. farther out. The distributor shifts load from the portable to the nearest stationary set when a haulage locomotive tends to add an overload.

With four 300-kw. Type HCC General Electric synchronous converters in service, a new unit of the same type has been ordered for Powhatan Point. It is to be furnished complete with controls, manual a.c. and automatic d.c., and mounted for portable service.

Firedoor Is Automatic

An automatic steel firedoor arranged to operate from bearing thermostats is a feature of a fireproof 300-kw. manual motor-generator substation recently relocated underground in Dorothy mine (p. 129). Because of bad top, the switchboard is placed in an ell with the roof supported at the open end by two brick columns and an H-beam. Walls in the ell and the motor-generator room are cement blocks and the ceiling support is steel rail carrying steel forms over which 8 in. of concrete was placed airtight against the mine roof. An I-beam was installed overhead parallel to the motor-generator shaft to facilitate installation and maintenance.

Only one mine covered in the *Coal Age* survey, Crow Hollow No. 1, producing 1,300 tons in three shifts, operates on 550 volts d.c., taken in two miles from one outside substation by a trolley wire (part 6/0 and part 4/0) in parallel with two 4/0 round wires. Track is welded 60-lb. rails and is not backed by auxiliary copper. Welds were made by the "Airco" process, using ¾-in. No. 22 manganese-bronze rod (see article beginning on p. 77 for joint cost). For one group where the average cost was $2.07, acetylene cost was 33c.; oxygen, 18c.; flux, 1c.; rod, 35c.; labor, $1.20.

Most of the mines use trolley wire of the size locally termed 6/0 on main lines. Two reported 350,000-cir.mil and a third, reporting 6/0, gave the weight as 1,060 lb. per 1,000 ft., which makes the wire actually 350,000 instead of 6/0. The latter would have an area of only 336,400 cir.-mils.

Maximum 275-volt d.c. transmission distance ranges from 4,000 to 8,000 ft. Except in special cases, Hanna limits the distance to 3,500 ft. for mobile units working in rooms. Any voltage below 220 at the motor in a working section calls for a power revision. The present maximum at Willow Grove No. 10 is 5,000 ft., but at Dun Glen No. 11 the distances are less than 3,000 ft. for wide work and 4,000 ft. for development. Powhatan Point now transmits 6,000 ft. but will cut to 5,000

as soon as the new portable substation is put into service. One mile is the approximate maximum at Rail & River No. 3, while at Wheeling Township No. 2 the distance from the innermost substation to the farthest working room is 6,100 ft.

Adequate voltage has been a first at Wheeling Township for many years and it is one of few mines where, without adding to electrical equipment and copper, the voltage gets better instead of worse as mining progresses. This results from a policy of developing to the boundary and then working back toward the portal. In this mine, Columbus (now I.T.E.) automatic breakers set to trip at 950 amp. (one serving each of six sections each with two Joy units) are mounted in portable steel boxes with permanent leads and skids on the back (*Coal Age*, June, 1936, p. 254). These breakers now are being improved by adding electric timing. In Willow Grove No. 10 and Dun Glen No. 11 mines, I.T.E. KSC breakers set at 600 amp. serve each mechanical unit. Powhatan Point has on order nine General Electric automatic sectionalizing breakers for shakers and belts and three automatic tie-feeder breakers.

Positive feeders of 1,000,000 cir.mils along main haulways and from substations to room entries are the rule at eastern Ohio No. 8 mechanical mines. Rail & River No. 3 continues that size up each 960-ft. mother belt to the last room neck. The positive and negative cables, both 1,000,000, were purchased in 160-ft. lengths with factory-assembled flat terminals of the bolted type (p. 129). Experience has indicated, however, that installation and moving would be further facilitated if the lengths were but 80 ft. Positive sections in these belt entry feed lines are insulated and the negatives are bare. Experience has demonstrated here also that the negative should have a weatherproof covering to prevent wire breakage.

Heavy Feeders Installed

In addition to the 350,000-cir.mil trolley wire, Wheeling Township No. 2 has a 500,000 feeder from outside to the first inside substation. From there to the second and third (portable) stations, 1,000,000 is used. From the portable to center of load are five 500,000 cables. Inby, the number drops to three and then two. One 500,000 is carried 1,200 ft. up the 1,600-ft.-long room entry. Four negative cables of the same size parallel the bonded 60-lb. rails inby from the portable substation to the center of the load. To doubly insure good power, a 60-lb. bonded and cross-bonded track is considered equivalent to 500,000 cir.mils of copper.

Negative feeders in 500,000- and 1,000,000-cir.mil sizes parallel to the track are common in the No. 8 field. A 1,000,000 negative extends in 4 miles from the slope portal at Rail & River No. 3. Most negatives are laid on the mine floor, but in permanent work in the Hanna mines they are mounted on the rib 2 ft. above the bottom.

Three mines in the region Thermit-weld their tracks. All 60-lb. main line in Willow Grove No. 10 is so treated, with about half (4,800 ft.) at Dun Glen No. 11. Thermit-welding also is the practice on the 90-lb. main line in a new opening at Wheeling Township No. 2.

The new Ohio Brass wedge-type bonds are being used on new room entries in Willow Grove No. 10. Steel arc-weld bonds, also 4/0 Ohio Brass, were the old standard and are used in Dun Glen No. 11. In Dorothy mine, 40- and 60-lb. joints are double bonded with Ohio Brass and Mosebach equipment. Powhatan Point also double-bonds 60-lb. rails with 4/0. In Blaine mine, Lorain Coal & Dock Co., the 56-lb. main line is bonded with 500,000-cir.mil long bonds applied with Ohio Brass "Duron" copper-alloy electrodes. Penn Machine "Super-weld" U-bonds are applied under the base of the rail in Rail & River No. 3 mine. As a rule, fishplates instead of angle bars are used on the inside of joints to make space for the bond terminals. Otherwise, a 5-in. section of the angle-bar base is cut away at the center.

Conveyor Starters Automatic

For controlling shaker conveyors, Ohio Brass Type KAD automatic motor starters are used exclusively in the Dorothy, Rail & River No. 3 and Crow Hollow No. 1 mines, as well as at Camel Run, Warner Collieries Co. Westinghouse starters control the 21 shakers working in Powhatan Point and two of the shakers in Witch Hazel mine, Florence Coal Co. The practice at some operations, such as Rail & River No. 3, is to install an Ohio Brass Type B fused multiple junction box at the neck of each shaker conveyor room, using a Miller receptacle on the cutting machine to supply the drill. At other shaker mines, such as Crow Hollow No. 1, the Type B junction box is at the face of the room.

Powhatan is equipped with Jeffrey junction boxes at the face, with the cables to these boxes taken off the circuit at the room neck through Ohio Brass fused connectors. At the head of each mother belt in Dorothy mine are two Ohio Brass 1,500-amp. safety switches. One controls the feed to the belt and cutting machines and the other the feed to the shaker drives.

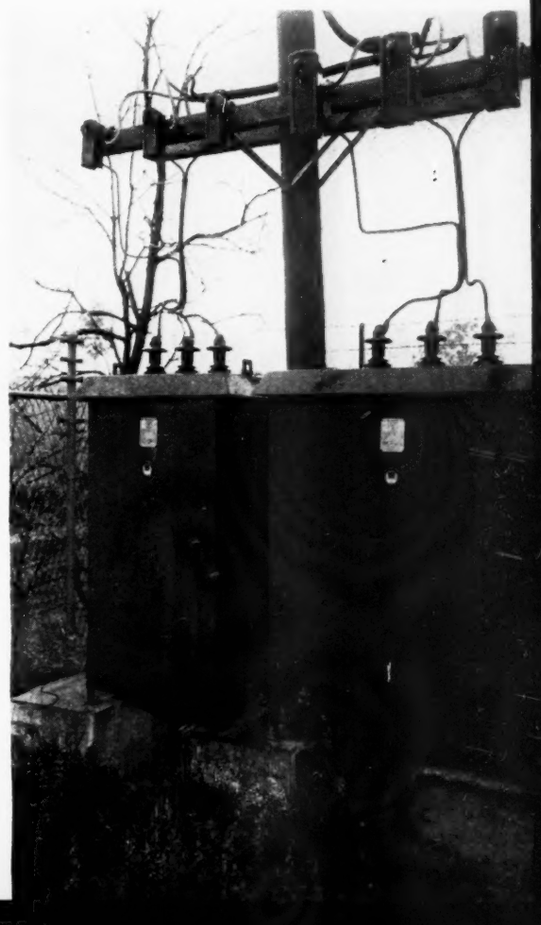
Eighty per cent of the cutting machines at the mines surveyed are shortwalls. Track-mounted cutting and shearing equipment is in use at the Wheeling Township and Hanna mines. With a few exceptions, trailing cables on both cutting and loading machines are the parallel-duplex type. In Willow Grove No. 10, although concentric No. 2 cables are used on Oldroyd cutters, parallel duplex No. 1/0 is used on Whaley No. 3 "Automat" loaders. Extra time for splicing is the reason for not using concentric on loaders, where delays are more costly.

Electric loads on locomotive haulage units are not as great in the eastern Ohio No. 8 mines as in many other coal fields. No tandems are in operation and 17 tons is the weight of the largest locomotive in use, an 8-wheel 4-motor Differential "Axless" unit which shares with a Jeffrey 2-motor 16-ton machine the haulage at Willow Grove No. 10. The Differential has a full-load rating of 30 m.p.h. with the motors in parallel, but the pairs of motors have been connected permanently in series to reduce speed. Motormen are not allowed to exceed 20 m.p.h. loaded or empty. A 15-ton Westinghouse three-motor locomotive works on the 4½-mile haul in Rail & River No. 3 mine. All locomotives servicing loading machines are cable-reel units.

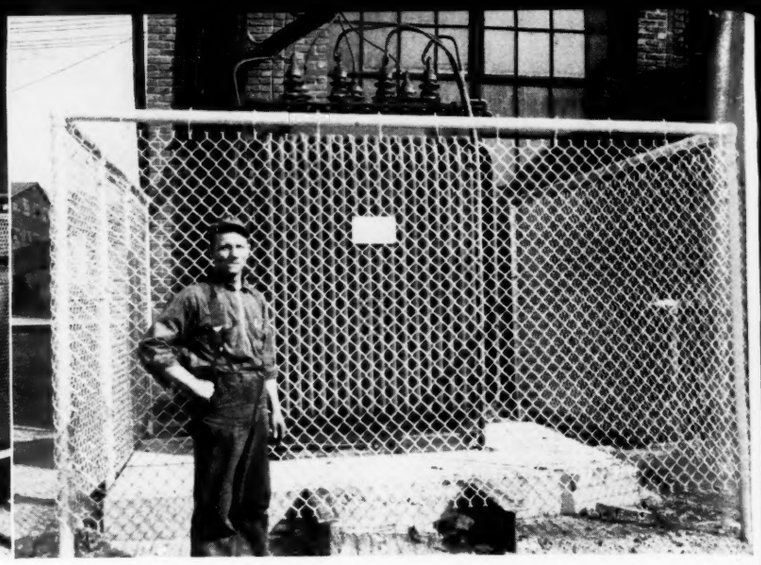
Eight battery-operated shuttle cars are used in Blaine mine, with three cable-reel cars in Wheeling Township No. 2. At Blaine, the "Philco" 48-cell batteries, in two 24-cell trays, are charged by Electric Products motor-generators. Time controls reduce the charging rate and finally open the circuit. Charging stalls are places in 9- to 10-ft. headings widened 6 ft. on each side for a distance of 12 to 14 ft. Two 90-lb. rails placed crosswise overhead act as monorails for trolleys and chain blocks which pick up the trays and place them on charging benches in the recesses in the ribs.

Cables feeding 4,150-volt a.c. power down through boreholes and shafts and along headings to substations are without metallic armor except at Willow Grove No. 10. At this operation, 17,000 ft. of underground a.c. cable is in use. Much of this is of the lead-covered and wire-armored type and was installed 8 years

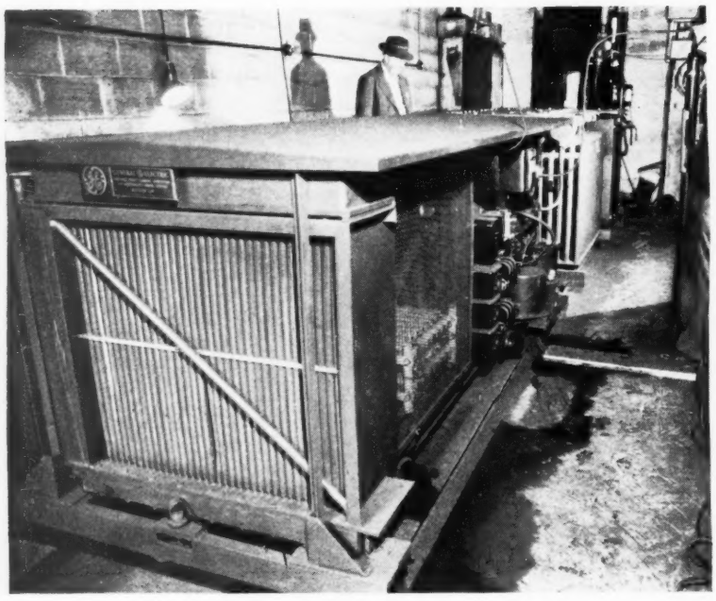
This 300-kva. capacitor raised power factor 2½ per cent at Dun Glen No. 11 mine.



Sealed-tube 300-kw. 275-volt rectifier substation, Dun Glen No. 11 mine.



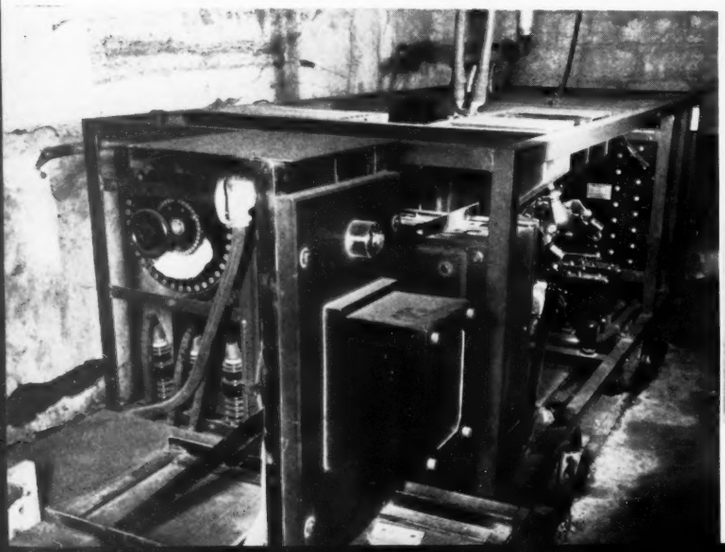
The 1,000-kva. auto-transformer in this fenced inclosure at Powhatan Point boosts the voltage from 2,300 to 4,000 for transmission to the new substations and mine fan.

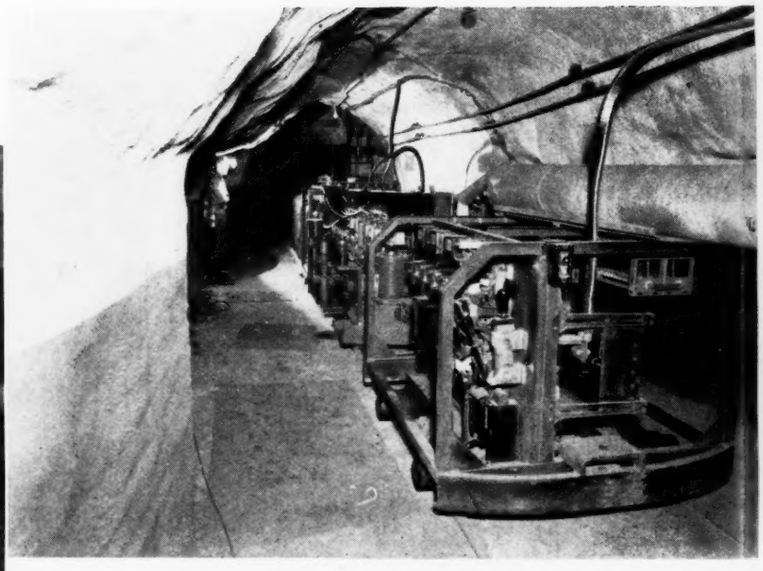


Portable rectifier substation, pumped type, in operation at the Rail & River No. 3 mine.

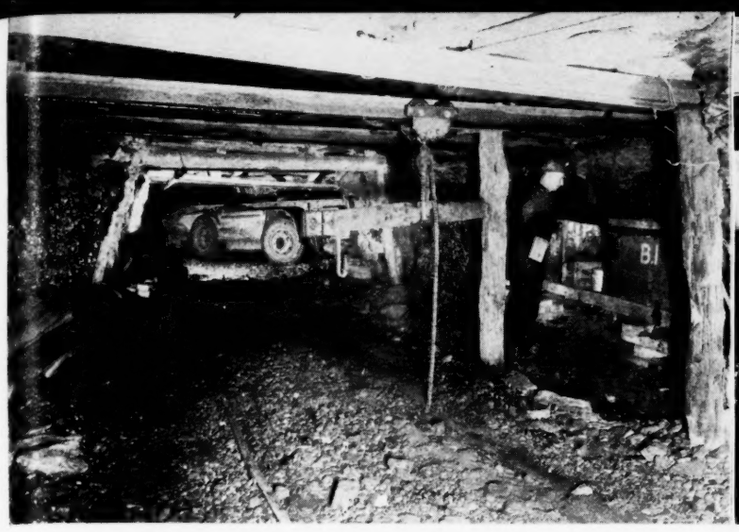
Adjusting excitation of the 75-hp. synchronous motor driving the fan at Dorothy mine.

The load in Wheeling Township No. 2 mine is distributed by the panel, center foreground on the portable substation.

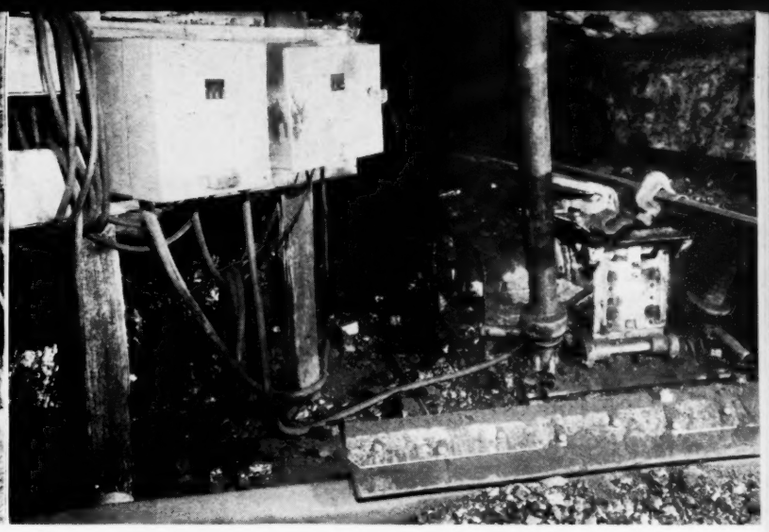




This 300-kw. 275-volt pumped-type rectifier substation has been supplying power for mechanical mining at Willow Grove No. 10 mine since 1939.

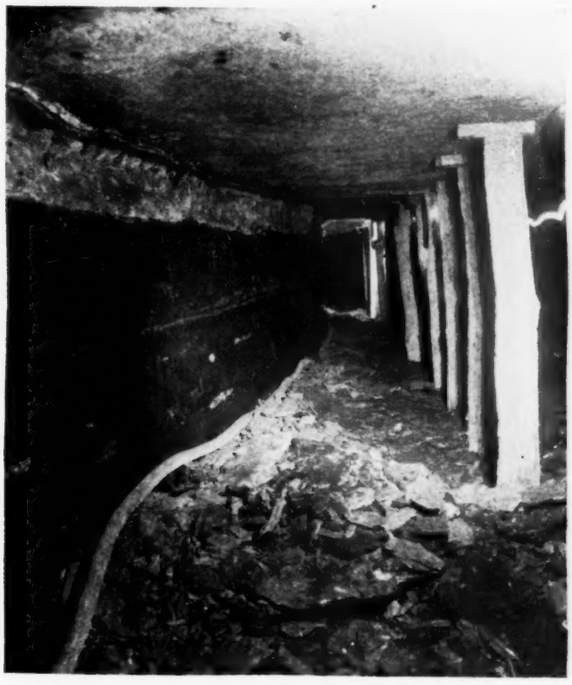


Extra batteries on charge (right) and, in the background, a shuttle car dumping in the Blaine mine.



Fused multiple junction box (left) and automatic motor starter near a shaker-conveyor drive in the Rail & River No. 3 operation.

This 2/0 rubber cable hanging in the air shaft at Dorothy mine supplies two underground substations totaling 700 kw.



This section of rubber-jacketed cable in an aircourse in Wheeling Township No. 2 mine is part of a 9,000-ft. run carrying 4,000 volts to the several substations.

Sectionalizing breakers are made portable at Wheeling Township No. 2 mine by a steel box with skids on the back and the leads attached.

A fused multiple junction box supplies the cutter and drill in each shaker-conveyor room at Crow Hollow No. 1.

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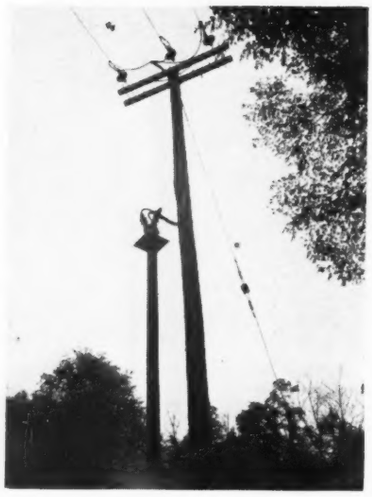


This rubber-sheathed borehole cable at Dun Glen No. 11 recently was moved 9,000-ft. to a new borehole.

ago. Plans for the future call for more pole lines and boreholes and a limit on underground cable transmission of one mile. Dun Glen No. 11 mine has but 300 ft. of a.c. cable along mine entries.

A year ago, 1,800 ft. of General Electric rubber-jacketed cable was installed in a trench along the haulway at Dorothy mine. In three sections, the cable is connected at two concrete-block vaults in the rib, each vault containing three knife-blade 4,000-volt disconnects. Steel faceplates for these vaults are securely bolted in place so there is no excuse for anyone but an experienced electrician opening them.

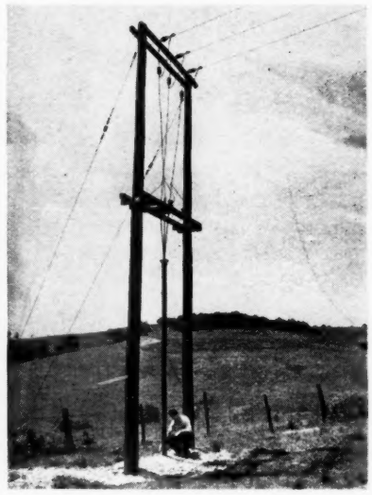
Cables of the same make are used in Wheeling Township No. 2 mine—600 ft. in one run and 9,000 ft. in another. The long run is in 700-ft. lengths and the splices are protected in General Electric cast-iron junction boxes filled with compound. These cables (No. 2 wires) are insulated for 7,000 volts and include a rubber jacket, jute-protected, and shielded conductors. They are laid in the aircourse next to the rib. Powhatan, formerly without a.c. cables underground, now is installing 4,050 ft. of General Electric No. 1/0 shielded cable containing three ground wires.

In a 267-ft. borehole cased with 4-in. pipe at Blaine mine, a 4,000-volt three-phase feeder consisting of three single-conductor Simplex Anhydrex AA—60 cables (size 1/0) insulated for 5,000 volts and with conductors shielded was installed recently. Lightning arresters at the top of the borehole are grounded to a plate buried near the pole. A ground connection runs from this plate to the top of the casing. At the bottom of the borehole the casing is grounded to the mine rails. The cables are hung from a Delta-Star "VEZ" clamp insulator support.

Cable Hung in Shaft

To supply the 700 kw. of underground substation capacity in Dorothy mine the 4,000-volt power is taken in by a No. 2/0 Anaconda 3-conductor cable hung on an Anaconda suspension in a new 160-ft. air shaft. A year ago, Rail & River installed in a 420-ft. borehole at No. 3 mine a new 455-ft. Anaconda cable with similar suspension. Conductors are 19-strand No. 2, rubber insulated and shielded. Outside diameter, including a "Duracord" loom weave, is 2.11 in. An Anaconda 1/0 cable and suspension at Dun Glen No. 11 recently was moved to a new borehole to serve an underground rectifier substation, also moved 9,000 ft. This non-metallic cable originally was installed in a 160-ft. borehole in February, 1940.

Preparation plants at the larger mines surveyed by *Coal Age* are powered, with a few exceptions, by 440-volt a.c. motors. Willow Grove No. 10 plant, including washing and heat-drying equipment, is driven by 52 motors aggregating 1,050 hp. Three are rated at 100 hp. and drive the run-of-mine conveyor, a crusher and a hot-air blower. The two mine-run feeders are

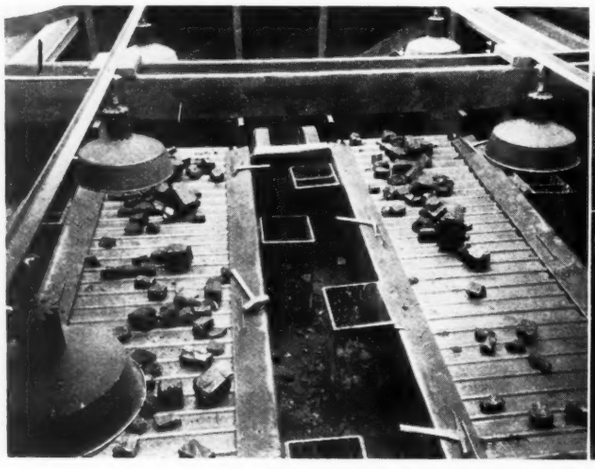


Three single cables (rubber-covered and shielded) carry 4,000-volt power into Blaine mine borehole.

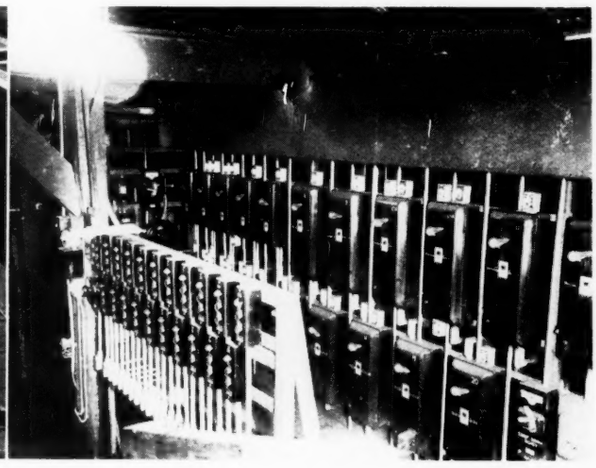
equipped with d.c. shunt motors, with field-control rheostats on the operator's platform, to permit speed adjustment. The motor speed range is 600 to 1,200 r.p.m. Powhatan Point preparation plant (Chance cone, no heat drying) is operated by motors totaling 562 hp.

Westinghouse De-ion breakers are used in the circuits of all motors in the Willow Grove No. 10 and Dun Glen No. 11 plants. The washing addition at Blaine is operated by 14 motors, each controlled by a Trumbull inclosed "Utility" circuit breaker and a General Electric magnetic switch. Rigid conduit protects the wiring in practically all plants. Some BX and Greenfield flexible are used, mostly for short runs.

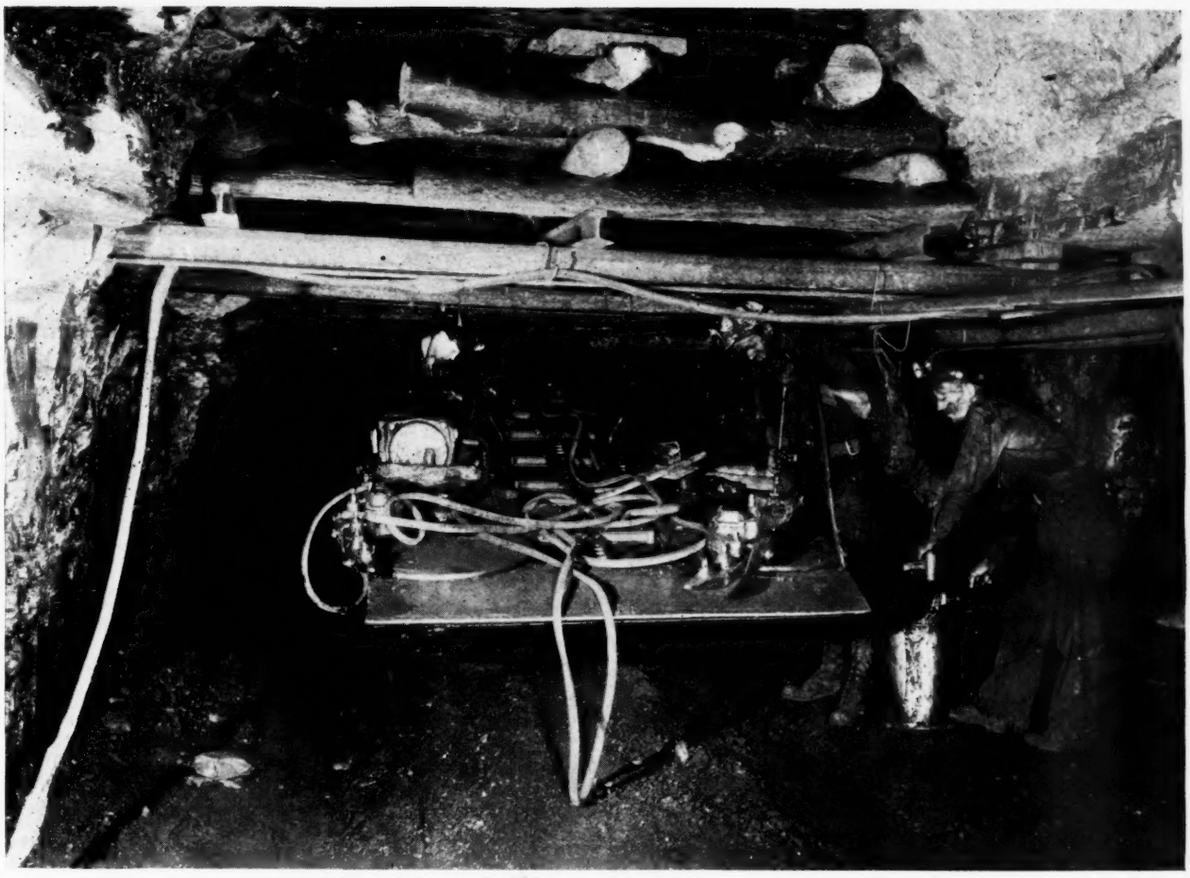
Picking tables in five of the larger plants are illuminated with General Electric 400-watt high-intensity mercury lamps. For the tables at Powhatan Point, now equipped with Mazda lamps, four large fluorescent units were on order at the time of this survey.



Six 400-watt high-intensity mercury lights at Dun Glen No. 11 typify picking-table illumination at No. 8 mines.



Indicating pushbuttons, line breakers and magnetic starters controlling the washery at Dun Glen No. 11 mine.



Loaders are greased during the lunch period in shuttle-car work at Blaine mine.

MAINTENANCE AND SUPPLIES

Eastern Ohio No. 8 Mechanical Mines

MECHANICAL and electrical maintenance at eastern Ohio No. 8 mechanical mines usually is supervised by one man, generally termed the "chief electrician." Considerably fewer men, as compared to mobile-loader operations, are employed in maintenance work per 1,000 tons of daily production in shaker-conveyor mines.

Mobile-loader lubrication, an important factor in maintenance at mines using this equipment, varies from operator greasing at the beginning of each shift to employment of special crews furnished with track-mounted lubricating machines. Repairmen stationed on the section handle running inspection and maintenance of loaders and auxiliary equipment in some mines, while in others electricians and mechanics work on call from a central shop.

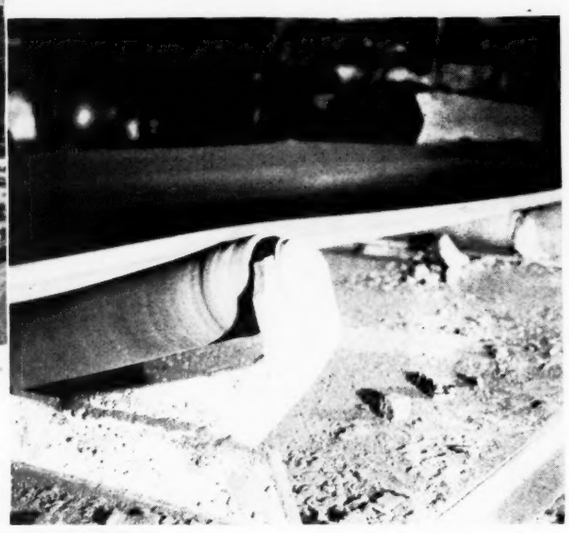
Mechanical mines in the No. 8 field practically all operate on a three-shift schedule. Lubrication at those using mobile loaders therefore is a real problem. At Willow Grove No. 10, Hanna Coal Co., a greasing truck services the Whaley No. 3 "Automat" machines, whereas at Dun Glen No. 11 no specialized equipment is employed. The Willow Grove truck carries four standard 55-gal. drums fitted with Alemite air-operated barrel pumps.

For five days a week, a two-man crew uses the truck from 10 a.m. to 6 p.m., thus taking in parts of two shifts and getting the advantage of the two lunch periods and a half hour between shifts for greasing machines while idle. These men also grease the Oldroyd cutters and, using compressed air, blow the dust out of the controllers on both cutters and loaders. Machine operators are supplied with small Alemite guns filled from 8-gal. portable tanks replenished by the greasing crew. Locomotives are greased in the underground machine shop by maintenance men when inspecting each week.

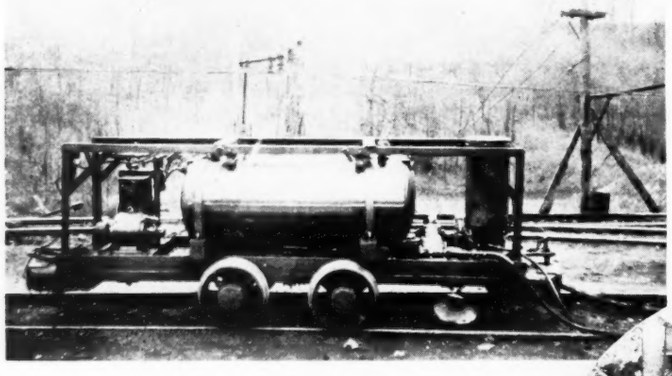
A greasing buggy was tried at Dun

This Willow Grove No. 10 greasing truck has four air-operated barrel pumps.

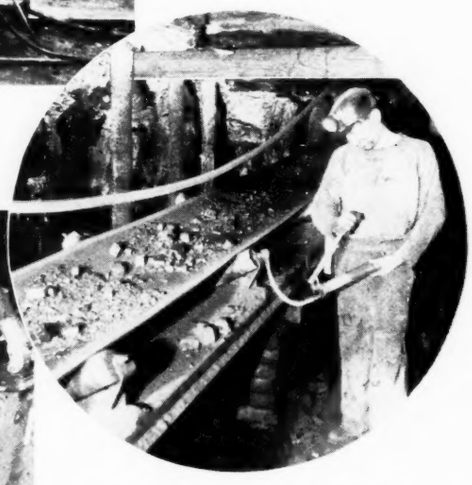
Permanent lubrication with sealed bearings on a mother belt in Dorothy mine.



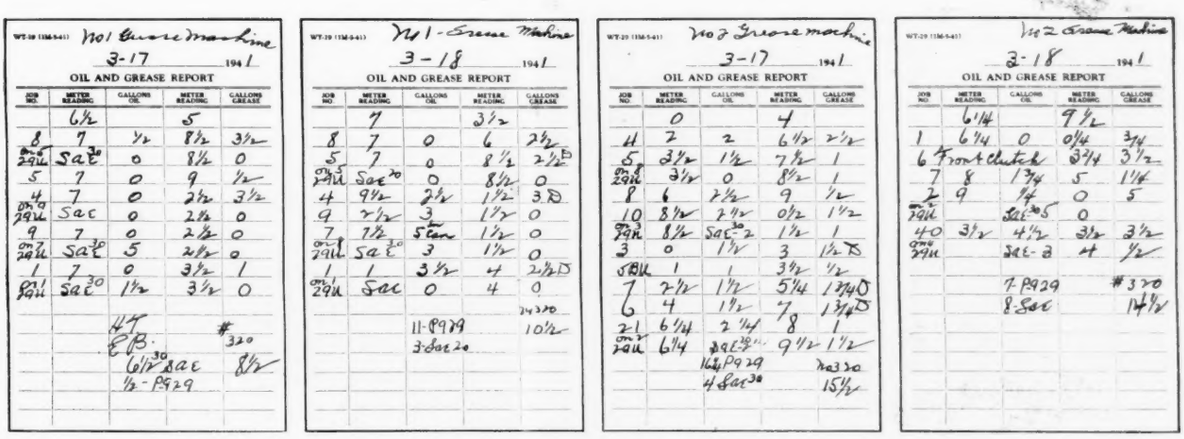
Combination air and electric greasing truck used at Wheeling Township No. 2 mine.



Rewired with heat- and oil-resisting cables, Willow Grove No. 10.



Greasing the mother belt during the shift in Rail & River No. 3 mine.



Consecutive daily reports from the greasing crews at Wheeling Township mine.

Glen No. 11 but was discontinued because of traffic congestion. Now, the mechanic stationed on the section handles most of the lubrication, with additional by operators as time permits.

Using eleven Joy 7-BU loaders and eight Jeffrey 29-U cutters, No. 2 mine, Wheeling Township Coal Mining Co., operates two greasing trucks. Each carries two 78-gal. tanks and an Ingersoll-Rand CE15 compressor (1½-hp. motor) fitted with regulating valve to maintain an 80-lb. air pressure in each tank. Niagara meters are installed on the outlets. A ¼-in. hose 24 ft. long dispenses oil, with another 1¼-in. 30-ft. hose for grease. Additional equipment includes an Alemite L75 electric gun (23 ft. of ¼-in. hose) for pumping grease into pressure-lubricated bearings.

Lubricants Are Metered

One tank carries grease for both loaders and cutters and the other light engine oil (loaders only). Meters are read before and after each greasing. Two men comprise a crew and grease the machines any time they get to them. Thirty minutes is required to completely grease a loader. Both cutters and loaders are greased twice in three shifts. Thus, they operate 1½ shifts per greasing. Many years of service has shown that the cost of maintaining the greasing machines is very small ($253 for material and labor for both in 1927 and $223.16 in 1938, when the mine worked 504½ shifts and produced 889,990 tons).

The greasing schedules call for refilling cups on the first shift and then both cups and disks on the second shift. At the end of the shift each greasing crew turns in a 4x6-in. card recording the quantities of each type of three lubricants used on each loader and cutter, as well as the total lubricant of each type dispensed. Meter readings on a greasing machine at the start of a shift are placed at the top of the record car for that shift. The meter dials read up to 10 gal. and then start again from zero. The Joy loaders have been equipped with gages like those on automobile engines to determine oil level.

Operators at Powhatan Point mine, Powhatan Mining Co., where mobile loaders develop for shaker conveyors, lubricate at the beginning of each shift. At Blaine mine, Lorain Coal & Dock Co., 7-BU loaders in narrow work are lubricated by the crew at the beginning of each shift, while those in wide work (shuttle-car service) are greased during the lunch period by the face boss and two crew men who eat 30 minutes early.

Shaker-conveyor operations using mother belts equipped with standard anti-friction bearings, such as Rail & River Coal Co. No. 3 (two 30-in. 960-ft. troughed belts in regular use), generally employ a utility man to handle greasing on the shift, in addition to such other duties as clean up. At Dorothy mine, Youghiogheny & Ohio Coal Co., where MRC sealed and lubricated-for-life bearings have been in use on two 770-ft. La-Del belts since December, 1940, only two were replaced in six months. Mine officials consider that a very low "lubricating cost."

Table I—Per-Ton Maintenance Costs (Labor and Materials)
No. 2 Mine, Wheeling Township Coal Mining Co.

	Mobile Loaders			Cutters			Locomotive Cost, Cents		Total Cost, Top and Underground
	Type	Age in Years	Cost, Cents	Type	Age in Years	Cost, Cents	Main-Line	Gathering	Equipment
1936	5-BU	10	6.94	Shortwall	20	2.9	....	...	18.4
1937	7-BU	New	3.00	Shortwall	21	3.5	....	1.5	16.7
1938	7-BU	1-2	4.50	29-U	New	1.8	....	1.4	13.5
1939	7-BU	2-3	5.50	29-U	1-2	1.5	....	1.4	13.6
1940	7-BU	3-4	5.40	29-U	2-3	1.8	1.00	1.3	13.3
1941*	7-BU	4-5	4.80	29-U	3-4	1.9	0.78	1.6	....

* January to July, inclusive.

Maintenance at Willow Grove No. 10 mine is headed by a master mechanic to whom the chief mine electrician reports. At Dun Glen No. 11, the head is a maintenance foreman who also is an electrical engineer. A superintendent of machinery, with headquarters at Piney Fork No. 1, where a central shop is located, is available as a consultant in equipment installation and maintenance at all mines.

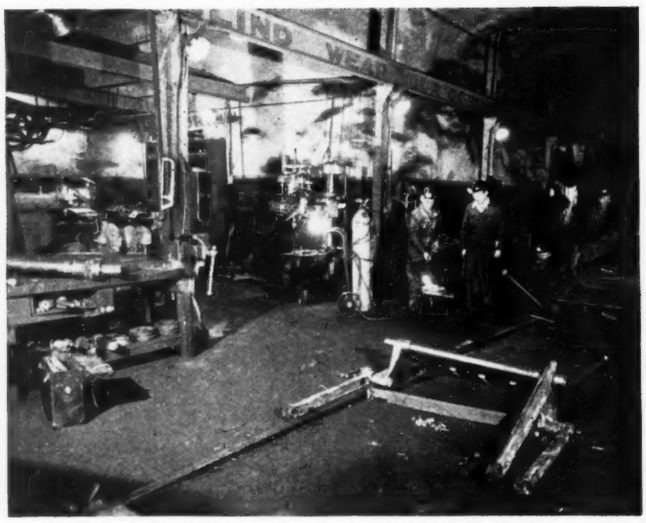
Shop Is Underground

The principal mine shop at Willow Grove No. 10, containing lathes and other machine tools, is underground within ½ to 1½ miles of the working faces. Mechanics, under the shop foreman, go out on call, riding a main-line trip, and get to the farthest place in 30 minutes. Machine inspections are made by mechanics twice a week. Three-fourths of a loader inspection is made while it is operating, but to complete it, which takes 5 minutes longer, the machine is shut down. After eight months of service conveyor chains on loaders are renewed, and after 18 months the whole unit is given a complete overhaul.

Of a total of 25 mechanics at Willow Grove No. 10, not including wiremen, four work in the underground shop making shafts and other parts and reclaiming certain items. An assistant maintenance foreman each shift underground heads the trouble-shooting and regular repair work. The outside maintenance crew comprises a foreman and eight men, all on the day shift.

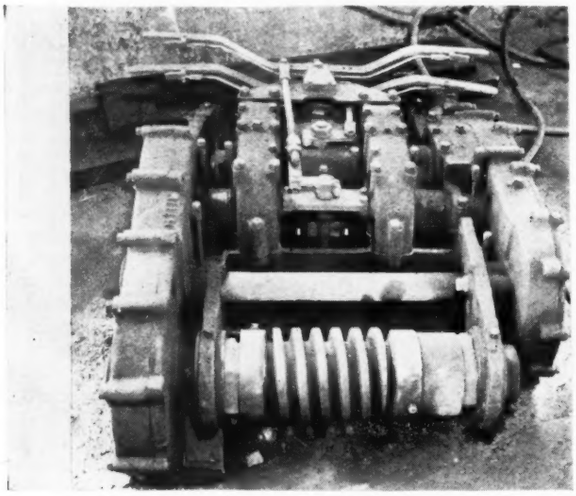
The Dun Glen No. 11 maintenance foreman has under him an assistant on each shift, a chief electrician, a shop foreman and tipple maintenance foreman. The machine shop is outside at the pit mouth, but at the time of the *Coal Age* field work a second shop with pits was being completed two miles underground. One maintenance man stays with each wide-work unit and another takes care of four units in narrow work.

Maintenance at Wheeling Township No. 2 mine, a drift operation, is headed by the chief engineer and purchasing



In this underground shop at Willow Grove No. 10 mine, the bay at the left side is equipped with machine tools for manufacturing shafts and so on.

Alloy-steel shaft forgings in the warehouse at Piney Fork No. 1, near the Hanna central shop.



Spare sub-link, one of the replacement items for the mounted cutters used in Hanna mines.

Bins in this aisle in the warehouse at Wheeling Township No. 2 mine contain mobile-loader parts.

In this shop at an outlying fan and substation at Powhatan Point mine, some 6,000 bits are tipped per day.

agent. The assistant chief engineer headquarters at the shop and acts as chief electrician and master mechanic. Under him is the foreman of an outside machine shop which works six men on the day shift and three men on each of two other shifts. No major repairing is done inside and there is no underground shop—just a small supply room. One head electrician and one maintenance foreman, with three mechanics working on each shift, are on duty inside at Wheeling Township No. 2. The mechanics stay on the working sections and inspect when not repairing. This continuous inspection is backed up by a week-end inspection of brushes and so on. Dates for complete overhauls are determined by inspection.

The chief electrician handling both mechanical and electrical maintenance at Dorothy mine, another drift operation using 22 shaker conveyors (14 with duckbills) and two mother belts, has under him a machine boss underground, ten mechanics and four wiremen on three shifts. One maintenance man stays on each of the two belt sections each shift.

Powhatan Point mine, the only shaft operation covered, with a complete machine shop near the tipple and a loader pit shop three miles underground, employs an outside man, designated as chief electrician, who heads all maintenance work. One man supervises maintenance of loaders on development and another shaker conveyors and mother belts. A mechanic, with laborer assistant, who cleans and lubricates, stays on each belt section.

11 Men Constitute Crew

Inside maintenance at Rail & River No. 3, a slope mine producing 4,000 tons from 22 duckbills and two belts in three shifts, is handled by one man per shift per belt section plus two additional inside men on the early day shift and two more at the slope-bottom motor pit on the late day shift. Three outside men, plus the chief electrician, who heads the entire work, completes the force of eleven. A Gunited 22x60-ft. shop with electric bridge crane and two motor pits was being installed.

Lathes are included in the equipment of an outside shop at Blaine drift mine (six 7-BU machines and eight battery-powered shuttle cars). At a pit shop 12,000 ft. underground and within 2,500 ft. of the farthest loader the master mechanic headquarters. Under him are six men each shift. One man each shift stays in the shop and even if there are no trouble calls two men go out to make inspections. A tipple repairman and three mechanics make up the outside crew.

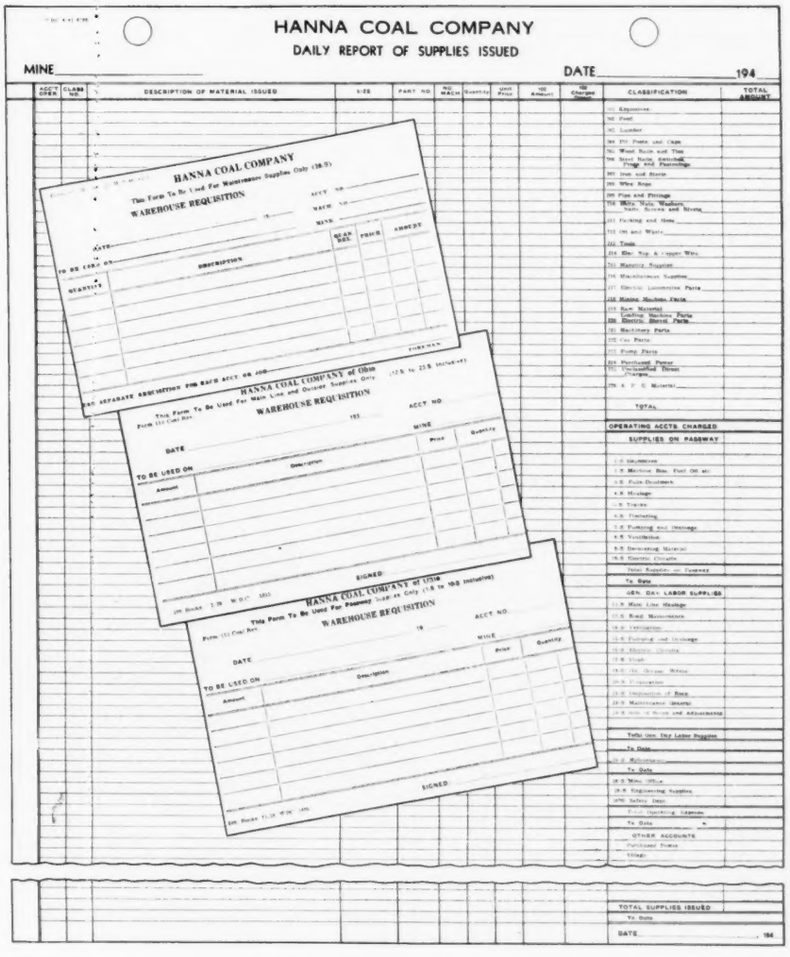
Although Blaine is equipped with a Phillips transfer truck to take a dead loading machine outside, the absence of track in shuttle-car sections makes such moves inadvisable unless absolutely necessary. Consequently, a method of changing armatures at the face devised by the master mechanic is used. With two assistants, such a change can be made in 10 hours, compared with several times that delay if the machine were taken to the repair pit.

Removing an armature is done as follows: (1) Elevate both boom and loading head to full heights; (2) set an 8x8-in. wooden crossbar on two posts under the center of boom; (3) block the head in elevated position on a crib of ties; (4) remove the fourteen ¾-in. pedestal bolts; (5) set an ordinary lifting jack under the head near the controller and raise 3 in. to clear the chassis; (6) pull out the chassis with the feed rope of a shortwall if armature is dead; if not, move chassis out under its own power; (7) take out the front clutch case and move field frame back about 12 in. so armature can be removed.

Unit maintenance of loaders—i.e., replacement of complete sections assembled in a well-equipped shop—is the practice at the mines which have used mobile loaders for several years. Hanna also has built up a complete stock of spare units for the front ends of Oldroyd cutters. These units, consisting of neck, sub-link, bowl, bit-clutch case and main link, are repaired and kept in readiness at the Piney Fork shop. In this shop, all shafts are made from alloy-steel forgings purchased in lengths adapted to each particular shaft requirements. Sixty-eight items different in diameter and/or length are on the list of forgings which the warehouse at Piney Fork is to keep in stock. Some of the alloy shaft stock is at Willow Grove No. 10 and Dun Glen No. 11, where many of the shafts are made. The material is a chromium-molybdenum-steel alloy (375 Brinell) and is never cut with a torch. Rex AAA tools are used for machining.

Shafts to operate in brass sleeve bearings are not made at the mine shop but are ordered machined with a ground finish on the journal sections. In anti-friction-bearing renewals Hanna buys new bearings only.

Cutter bits are tipped with Borod after each use at Camel Run mine, Warner Collieries Co.; Powhatan Point, Crow Hollow No. 1, Rail & River No. 3, Wheeling Township No. 2 and Dorothy. None regrind between tipping. At Crow Hollow No. 1, where grinding was found uneconomical, bit cost is now 0.69c. per ton. Rail & River No. 3 tips 2,000


HANNA COAL COMPANY

DAILY REPORT OF SUPPLIES ISSUED

MINE_____ DATE_____ 194

HANNA COAL COMPANY

WAREHOUSE REQUISITION

HANNA COAL COMPANY of Ohio

WAREHOUSE REQUISITION

HANNA COAL COMPANY of (7)(8)

WAREHOUSE REQUISITION

Supply-requisition and stock-report forms used at Hanna mines.

bits per 4,000 tons produced. Tipping at Powhatan Point (6,000 bits in 24 hours for 6,500 tons of coal) is done at a two-man three-shift bit shop at an outlying fan. These men also look after the fan and a d.c. substation. Some 4,000 bits are tipped during two shifts of bit-shop operation at Wheeling Township No. 2 mine (4,800 tons in three shifts). These Borod-tipped bits cut 35 per cent more before dulling than the heat-treated bits formerly used. At Dorothy mine, Borod tipping has been the practice for five years.

Because of hard service, especially in shearing, heat-treating of bits was started recently at Dun Glen No. 11. New bit blanks are cut with a torch from S.A.E. 9260 bar steel. After cooling following rolling, the bits are reheated to 1,300 deg. F. and then submerged in quenching oil. Temper then is drawn in a bath of molten salt brought to 400 deg. F.

Tire Welding Being Tried

A few sets of arc-welded locomotive tires now are being tried at Powhatan Point. These were filled by Westinghouse, using an automatic arc-welding machine. Turning tires twice in a lathe and then taking them out of service when the thickness gets below 1⅝ in. on main haulage or 1½ in. on gathering is the Hanna practice. Hanna, however, is saving certain sizes of discarded tires in case a shortage should make filling necessary. Rolled-steel wheels instead of tires and wheel cores are used at Rail & River No. 3 mine.

Three companies wind armatures in their own shops: Y. & O. at a central shop at Barton; United States Coal at the main shop near the tipple; and Rail & River at an outlying fan where the winder also can oversee fan operation. Glass-insulated motor windings were in use at four mines. Glass has been used on all Wheeling Township No. 2 locomotives for two years. Seven of the last Jeffrey 35BB permissible shortwalls at Powhatan Point are glass-insulated. At Blaine, one 35B cutter and an MH96 Jeffrey locomotive are operating with glass-wound armatures. No trouble has been experienced with three 35B armatures in two years of service at Crow Hollow No. 1. These were wound in the coal-company shop with coils furnished by the National Electric Coil Co.

Several companies rewire underground machinery with special heat- and/or oil-resisting cables. Rockbestos or Deltabeston is used to rewire all equipment at Willow Grove No. 10. On locomotives, mining machines and loaders at Dun Glen No. 11, Glyptal cables are used for normal operating temperatures of about 80 deg. and Rockbestos or equivalent for leads in field frames and resistances. Most of the rewiring of locomotives and cutters at Dorothy mine is done with Rockbestos. Powhatan wires all underground equipment with Deltabeston. Two locomotives at Blaine have been rewired with Rockbestos as a start on a program to include all underground equipment.

Plans for vulcanizing trailing cables are under way at mines of the Hanna Coal Co. and the Lorain Coal & Dock Co. Parallel-duplex trailing cables are used throughout the field except that Hanna uses concentric on Oldroyd cutters. Parallel-duplex, however, is used on the Whaley "Automat" loaders, where delays are more costly, because of the shorter time for splicing compared to concentric.

New arc-welders are frequent. It is now generally conceded that in most cases a property should have a motor-generator welder in the preparation plant, another in the outside shop, and one or two underground. In the underground shop at Dun Glen No. 11, the wheels have been taken off a Lincoln Shield-Arc machine, which normally sits on the floor at one side out of the way. If needed on a working section, it is picked up with the shop crane and set in a mine car. If mounted on track trucks it would have required track space while in normal working position in the shop. An Ohio Brass resistance welder is kept on the section in Rail & River No. 3 mine and is taken to the room faces for repairing shaker-conveyor equipment.

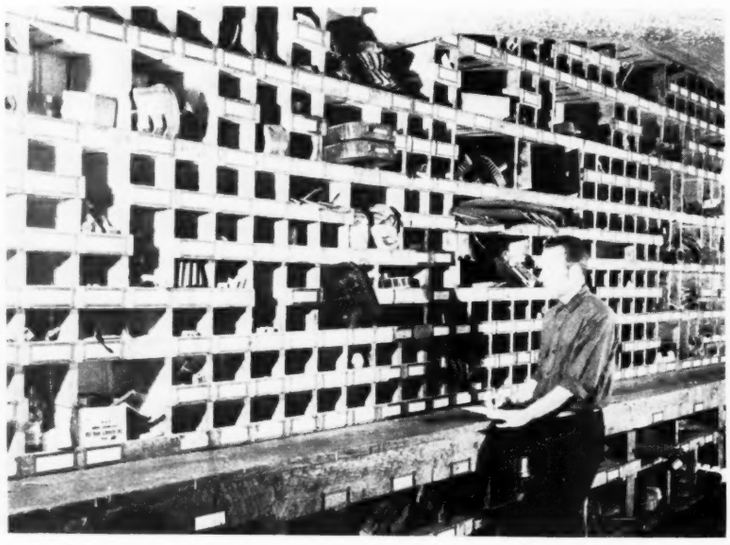
Supply inventory totals for the larger 100-per-cent mechanical mines range from $12 to $18.50 per ton of daily production. The average is $15.62. All of these mines work three shifts and on a per-shift basis the inventories are triple the foregoing figures. Perpetual inventory systems are in use at the Wheeling Township and Hanna mines. The latter use book systems for entering receipts and disbursements. For the most part each Hanna mine carries its own supply stock. The warehouse at Piney Fork No. 1, however, carries an excess of special materials upon which the other mines can draw and which also furnish the special needs of the central shop.

26 Material Classes

For warehouse accounting the materials are divided into 26 classes. Requisitions on the warehouse, depending upon destination, are made on one of three forms carrying the following legends: (a) "This Form To Be Used For Maintenance Supplies Only (26-S)"; (b) "This Form To Be Used For Main Line and Outside Supplies Only (12-S to 23-S inclusive)"; (c) "This Form To Be Used For Passway Supplies Only (1-S to 10-S inclusive)." The latter, covering operations between the main line and the coal face, includes explosives, falls-deadwork, haulage, tracks, timbering, pumping and drainage, ventilation, recovering material and electric circuits.

A "Daily Report of Supplies" sheet is prepared by the warehouse clerk, who enters individual items from the warehouse requisitions under the following column heads: "Operating Account," "Description of Material Used," "Size," "Part Number," "Number of Machine," "Quantity," "Unit Price," "103 Amount," "102 Charged Direct," and "Total Amount." Printed in one column on the form under "Classification" are the types of materials and corresponding account numbers.

A card system is used for the perpetual inventory at Wheeling Township No. 2 mine, and the clerk in charge of the warehouse is responsible to the assistant treasurer. On every card, a minimum stock figure is set up by the operating department and it is the clerk's duty to reorder in quantities and at sufficiently frequent intervals to maintain that stock. Bins containing repair parts for underground machinery are grouped for each type machine. Bin labels carry complete information including bin number, catalog number and name of part.



Locomotive and cutter parts section in warehouse at Wheeling Township No. 2.

OPERATING SAFEGUARDS

Eastern Ohio No. 8 Mechanical Mines

ADOPTION of a high percentage of the measures recommended for safe mine operation characterizes mechanical properties in the eastern Ohio No. 8 field. Particularly noteworthy are advances in ventilation and dust control. The latter is marked by widespread use of rock dust and rapid growth in installation of sprinkling systems. Good housekeeping, with emphasis on cleanliness and proper guarding of wire, equipment and other facilities, is the rule.

Educational work carried on by operating and safety departments with the cooperation of the U. S. Bureau of Mines and the Division of Mines, Ohio Department of Industrial Relations, is supplemented by universal use of such protective clothing as hard hats and safety footgear. Wearing of goggles where flying material is likely to be encountered is increasing. Respirators for men in dusty occupations are commanding greater favor, although, as stated, increasing use of sprinkling is materially reducing flying dust.

Electric cap lamps (Edison, Wheat and Portable) are used in all mechanical operations. At Powhatan Point mine, Powhatan Mining Co., other protective equipment is supplemented by M-S-A self-rescuers for every man working underground. New mining machinery usually is permissible or flameproof, and carbon dioxide or permissible powder is used in practically all cases, with those employing other mediums planning a change in the immediate future. Ventilation improvements (see article beginning on p. 81) include new fans and air shafts, increased splitting to eliminate operation on continuous currents, improvement of airways and widespread use of positive means (normally brattice lines) of conducting air from room neck to working face.

The major hazard in the No. 8 field, as in all others, is the top, particularly the "stone," or drawslate immediately over the coal. This is taken down in haulage openings (and in aircourses at some properties), as well as in rooms in mobile-loader mines. While this results in the characteristic "rider" seam becoming the working top, careful and systematic timbering (see article beginning on p. 60) is the rule because the "rider" is overlain by thick strata of weak unconsolidated lime. In conveyor operations, the drawslate is held in rooms by several rows of posts in some cases but usually by single or double planks (see conveyor-mining article, p. 70), supplemented by roof jacks at the face. Entry protection consists of steel bars, usually on short legs hitched into the ribs out of the way, or Gunite.

Rock-dusting at least to the mouth of each room is the usual practice at the mines surveyed by *Coal Age*. Mines using mobile loaders and cars normally employ track-mounted dusting equipment, such as the M-S-A, Diamond, Legrabon, etc. At shuttle-car and conveyor operations, standard equipment for dusting tracked places, such as entries, is supplemented by smaller portable or semi-portable units in the working sections. In shuttle-car territories at No. 2 mine, Wheeling Township Coal Mining Co., as an example, Canton "Midget" machines are set on the tail ends of the cars, which are loaded with bags and thus can be used to dust any part of the workings. Conveyor operations using portable dusters include Rail & River No. 3 and Powhatan Point; semi-portable, Dorothy mine, Youghiogheny & Ohio Coal Co. (M-S-A in each case). At Rail & River No. 3 mine, a sack of rock dust also is kept in each place, and dusting is done by hand once a day.

Water tanks on cutting machines are supplemented by a piping system and a special car for dampening haulage roads at Willow Grove No. 10 mine, Hanna Coal Co. Piping systems also will be constructed at the company's Dun Glen No. 11 and Piney Fork No. 1 properties. A 120-gal. tank is installed on the side of each cutting machine at Willow Grove, and an electric pump supplies water to the cutter bar at a pressure of 50 lb. per square inch.

All room entries are piped to the first

Self-rescuers are supplied all men working underground in the Powhatan Point mine, Powhatan Mining Co.

Rock-dusting into the working sections is the rule, as in the Camel Run mine of the Warner Collieries Co.

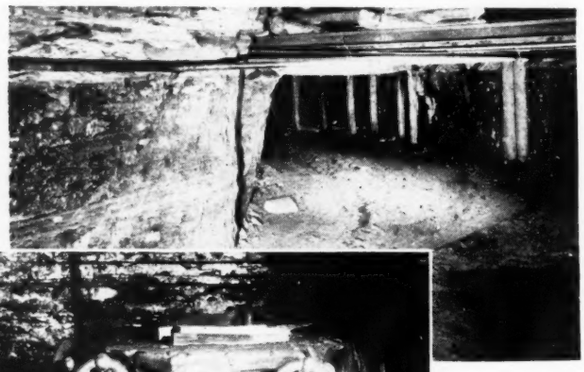
room, at which point the cutter tanks are filled. Fresh water is used. One side of the mine is supplied by damming a creek at the air shaft, in which a column line is installed to connect to the mains on the bottom. The other side is supplied through a 265-ft. borehole from a lake made by damming fresh-water springs. The piping system is being arranged to permit sprinkling both cars and haulage roads as desired. Meantime, a water box has been adapted to wetting down haulage openings. A 1,000-gal. steel tank on an eight-wheeled truck is supplemented by a small Deming-Mueller centrifugal. Pipe and valves are arranged so that the pump can take water from sumps for delivery to the tank and then, by proper valve manipulation, pump the water from the tank to sprays.

A 1¼-in. water line is installed on timbers on room entries in Blaine mine, Lorain Coal & Dock Co. Lines start at the mouths of the entries and are extended inby to the farthest neck. A tee and hose couplings are installed at every other joint. Water for sprinkling is hauled in in cars. In the actual sprinkling operation, a car is connected to a pipeline. The crew then takes a 300-ft. length of hose and starts to work, coupling on at the tees as required. Sprinkling is done to face where possible, and shuttle-car runways are given particular attention. The mine works two shifts a day and sprinkling is done on the third.

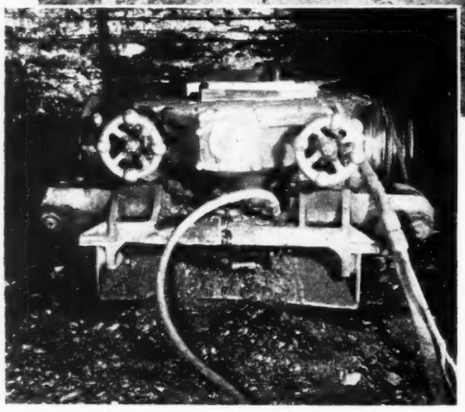
Piping at Powhatan Point extends to each room neck, from which a hose line is carried to the face to permit use of water on the cutter bar, for sprinkling shot-down coal and similar work. Sprays for wetting cars also are installed on all haulage roads.

Fresh sprinkling water at Rail & River No. 3 mine is supplied by a hill-top reservoir filled by pumping from a creek. From this lake a 3-in. line is carried down the air shaft, with smaller branches to the working sections. Eventually, these smaller lines will be replaced with 3-in. pipe also. A pump at the bottom of the air shaft forces the water back to 2-in. lines in main-face entries and 1¼-in. lines in room territories. Each working place is supplied with a ½-in. hose in 50-ft. sections. In cutting, the nozzle feeds water onto the bar. After the coal is shot, it is wet down with the same hose, which is hung over the pan line during loading. Sprays are installed on each elevating conveyor serving entry-driving units and on each mother-belt head to wet the coal as it goes into the car. In addition, each empty car is sprayed as it leaves the bottom on the way to the inside.

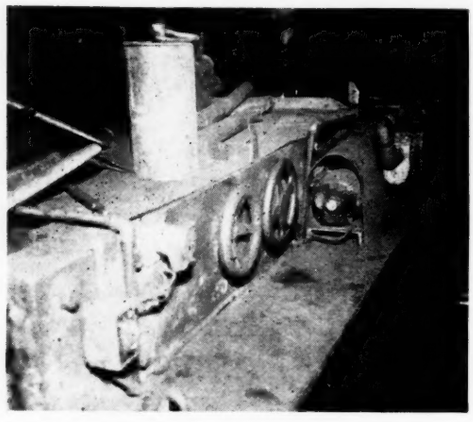
Pipe is carried to the conveyor swivel in each working place in Dorothy mine. Hoses then conduct fresh water to the cutting machine and also are available for sprinkling the coal after shooting and during loading.



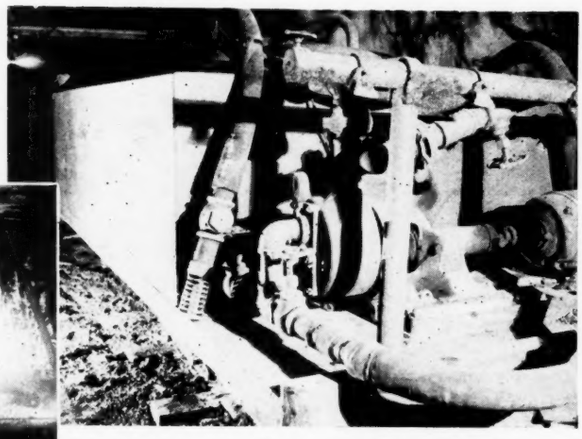
Left, water line along room necks in Blaine mine, showing one of the tees for the hose connections.



Hoses carry water to face at Rail & River No. 3 for use on cutter bars and for general sprinkling.



Water tank and pumps on track-mounted cutting machine, Willow Grove No. 10.



Business end of the water box employed to sprinkle main roads at Willow Grove No. 10.

Pipes are carried to the swivels in Dorothy mine, with hoses to the cutters and for other sprinkling.

ELECTRIC STRIPPING

Eastern Ohio No. 8 Field

MOVING up to 65 to 70 ft. of overburden to recover 42 to 54 in. of coal, the three electric strippings in the eastern Ohio No. 8 field use vertical and sidewall drills, 3- and 4-cu.yd. loading shovels, tractor-trailer units or trucks for haulage, and other equipment to match. Hilly country prevails, and the general dip of the No. 8 seam is approximately 1 per cent. Consequently, while it is below drainage on the southeastern edge of the field, it outcrops on the hillsides and in knolls to the northwest, thus providing an opportunity for stripping. The usual working plan is to go in on the outcrop and work back, usually three or four cuts, to the stripping limit. Occasionally, where knolls or relatively wide, flat valleys occur, or the ground slope is less than usual, the stripping area is increased.

Powder and liquid oxygen are used to break the overburden and vertical holes are most common. One-way hauls from pit to tipple range up to 4 to 5 miles, and the haulage units operate over heavy-duty highways, complete with bridges, to the pit entrances. From the latter, usually in the ends of the pits, the units run on the coal.

Stripping at Georgetown No. 12 mine, Hanna Coal Co., is handled by a Marion 300 machine with 80-ft. boom, 54-ft. stick and 8-cu.yd. manganese-lip dipper. This machine, moved in from the Iron Range and rebuilt, went into service in January, 1940, accompanied by a Bucyrus-Erie 44-B loading shovel with 3-cu.yd. dipper. Erection of a new Bucyrus-Erie 550-B machine with 99½-ft. boom, 67-ft. stick and 17-cu.yd. "Man-ten" dipper started in July this year. A stripping limit of 65 to 70 ft. is expected with this unit, accompanied by a new 54-B loader with 4¼-cu.yd. dipper. A Bucyrus-Erie 27-T blast-hole drill has been supplemented by two new 29-T machines. Other equipment, present or on order, exclusive of trucks, includes one International T-40 and two Caterpillar D-7 tractors with LaPlant-Choate bulldozers; Allis-Chalmers tractor with blade and Hough broom for coal cleaning; Schramm portable compressor for block-holing, ditching, shop work, etc., and a Galion road patrol. Water is handled by three Jaeger gas-driven centrifugal pumps (2-, 2½- and 4-in.).

70-Ft. Stripping Limit

Average coal thickness is 52 in. Overburden thickness (hillside work) varies from as little as 6 to 9 ft. on the outcrop up to the working limit (new stripper) of about 70 ft. Over the seam is a foot or so of the characteristic No. 8 drawslate, followed by the "rider" coal (18 in.) and soft to hard clays and limestones up to an upper, or "rooster," seam 1 to 2 ft. thick 15 to 25 ft. above the main seam. Members in the interval, however, may thicken to a point where the upper seam is as much as 40 ft. above. In lower banks and with a normal interval, clay and surface material usually overlay the upper seam.

In banks of 45 ft. or more, however, the upper seam generally is overlain by 8 ft. or so of brittle limestone in layers 8 to 12 in. thick separated by soft limestone-clay streaks. Next is a layer of limestone "boulders" 2½ to 3 ft. thick, a layer of clay 1 to 2 ft. thick, and another layer of "boulders" 2½ to 3 ft. thick. The "boulders" are the chief troublemakers in stripping, due to their tendency to crack up in large slabs and chunks. Consequently, "decking," or dividing of charges, is resorted to in high banks to insure proper breaking of this formation.

With present equipment, the usual stripping cut is 45 ft. A 35- to 40-ft. coal berm is left, making usual pit width 80 to 85 ft. Although straightaway operation, beginning on the crop, is the rule, opening up one relatively wide valley was done by box-cutting. Since the idea naturally was to make the box cut as

Section of bank being shot with vertical holes, Georgetown No. 12.

Pit-cleaning unit with rotary broom in action at Georgetown No. 12.

17-cu.yd. electric stripper at work at Betsy.

Loading at Georgetown No. 12, showing the original 10-ton end-dump trucks.

Most of the drilling at Apex is done with this sidewall unit.

Drilling overburden at Betsy.

Stripping and loading equipment at corner in Apex pit.

Loading in the Betsy pit, showing the tractor-trailer haulage units.

far up the hillside as possible to insure maximum recovery of coal, the 44-B loading shovel was called in to help, as shown diagrammatically in Fig. 1. Keeping a road out front by casting back from time to time, the 44-B relayed the spoil from the big machine on up the hill, forming short rows at right angles to the main row.

In regular work, the overburden is broken with liquid oxygen and a variety of powders, depending upon depth of bank and character and hardness of the rock. Hole spacing likewise is varied, but in average banks with bottom loading only, the usual figure is 30 ft., and the explosive is duPont No. 3 or 5 free-running (4,000 and 5,100 f.p.s.) or duPont EL-306 (6,000 f.p.s.). Where decking is done, of which Fig. 2 is an example, the faster L.O.X. or duPont EL-376 (8,000 f.p.s.) is employed to break the "boulders" previously referred to. Depending upon conditions, the yield per pound of explosive is 8 to 16 cu.yd. The new 29-T drills carry 9-in. tools, which have increased drilling speed approximately 30 per cent.

Haulage equipment at the time of the *Coal Age* survey comprised six White trucks with 10-ton Wood end-dump bodies, supplemented by three hired machines. On order were six Dart units with 18-cu.yd. 15-ton bodies. All are gas jobs. The haul at Georgetown No. 12 varies from practically nothing (at the tipple) to three miles. The average (one way) is 1½ to 2 miles, entirely on coal. Present trucks average 3 to 4 miles per gallon of gasoline.

Opened in 1935, Apex mine, Industrial Coal & Iron Co., strips with a Marion 5560 shovel with 96-ft. boom, 62-ft. stick and 16-cu.yd. counterweighted dipper (manganese front and cast-steel back), and loads with a 480 machine with 3-cu.

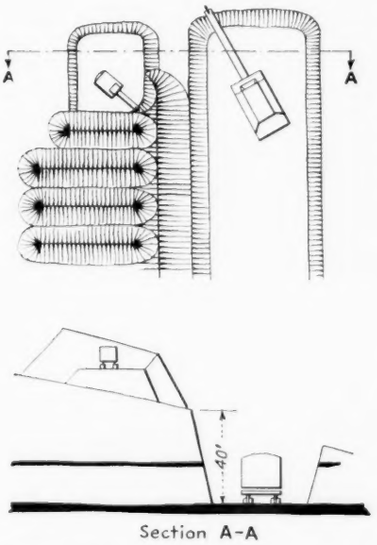


Fig. 1—Diagrammatic sketch of method of opening box cut, using small shovel to relay spoil back up sloping bank at Georgetown No. 12.

Part of the main road at Apex, showing concrete bridge over highway.

yd. dipper (boiler-plate front and cast back). Auxiliary equipment, aside from haulage units, includes a 371 Marion gas shovel with 2⅞-cu.yd. loading and 1½-yd. dirt dippers (occasional loading and miscellaneous work); 12-cu.yd. Austin-Western scraper for road work, ditching, etc. (but not for stripping); Caterpillar D-8 tractor with LaPlant-Choate bulldozer; and Austin-Western maintainer for pit cleaning and road work. Water is handled by 3-in. centrifugal and plunger pumps. Drilling is done by one Sullivan "Stripborer" (sidewall) and one Cyclone vertical machine. A Sullivan portable compressor is available for block holing and other work.

15,000 Yd. Per Day

Average coal thickness at Apex is 42 to 44 in. Overburden thickness ranges from a few feet on the crop up to the normal maximum of 55 ft. Average stripper output is 15,000 cu.yd. per day of 22½ hours. In working in on the crop, cut width may be as much as 100 ft. On succeeding cuts, however, usual width is 40 to 45 ft., which, with a 40- to 50-ft. berm, makes the pit width 80 to 95 ft.

The seam is topped by a "bone coal," or "rash," 2 to 4 in. thick, followed by 1½ to 2 ft. of "soapstone" (drawslate), over which, occasionally, is the No. 8 "rider" coal. Soft unconsolidated lime ("fireclay") makes up the material underlying the first limestone member some 8 ft. over the coal, which is separated from an upper limestone some 12 ft. thick by 1 to 1½ ft. of soft to hard fireclay. Above the upper limestone and usually 27 ft. above the main seam is the thin upper seam, followed by shales plus, in high banks, sandstone.

Drilling normally is done by the sidewall machine. Normal hole spacing is 16 ft., with the maximum as 18 and the minimum in very narrow cuts 12 ft. Holes are put in just under the first hard limestone stratum. The vertical drill normally is used only in banks over 50 ft. and then only if the sandstone is present in the top. Hole spacing with the vertical unit (6-in. tools) normally is 20 to 24 ft. Shooting is done with Atlas RXL 48-A (4½x16-in. sticks). Charge per hole ranges from 100 to 250 lb. On test sections, the yield has been 8 cu.yd. per pound of powder loaded in the holes.

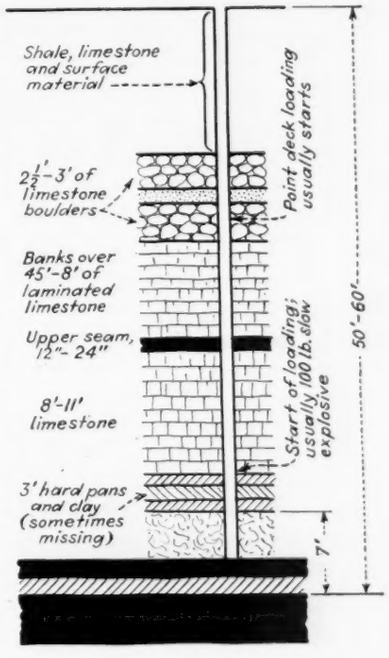

Shale, limestone and surface material
2½'-3' of limestone boulders
Banks over 45'-8' of laminated limestone
Upper seam, 12"-24"
8'-11' limestone
3' hard pans and clay (sometimes missing)
7'
Point deck loading usually starts
Start of loading; usually 100 lb. slow explosive
50'-60'
Where loading is in bottom only, usual explosive charge, holes on 30' centers, is 100 lb.

Fig. 2—Showing "decking" of charges under one overburden condition at Georgetown No. 12.

of Autocar tractors (Waukesha gas engines) each pulling an Austin-Western 16-ton trail car. With another on order, eight of these units were making eleven to twelve trips each and delivering 1,250 to 1,300 tons per loading shift over an average round-trip distance of 8 miles. Two loading shifts are worked on days when the preparation plant operates. Average mileage per gallon of gasoline is 2½. Average tire mileage in 1940 was 30,000 largely due to the improved main road.

The Apex main road, including one concrete bridge over a county highway, is built on clay fills. The running surface is made of three 2-in. layers of minus 2-in. crushed limestone. Between layers is 2 in. of clay. The whole was rolled down and dressed with C-2 road oil (0.4 gal. per square yard). The road is reoiled every spring and surfaced with No. 6 slag for traction. Construction cost was approximately $5,000 per mile. The company produces the necessary limestone in its own plant.

Betsy mine, The Jefferson Co., started producing in 1934, and now operates two stripping and loading units, one engaged in opening up and loading crop coal and the other in production from second and succeeding cuts under deeper cover. Average coal thickness is 54 in. Maximum stripping depth normally is 60 to 65 ft. Little rock is encountered in banks under 30 to 35 ft. In banks of 40 to 45 ft., the hard material represents about 18 ft.; 60-ft. banks, 22 to 24 ft. of hard material. The usual foot or so of drawslate on the coal is followed by about 3 ft. of "rider" coal, then by the usual soft unconsolidated lime, or "fireclay," and 14 ft. or so of regular limestone, topped by the upper seam, which generally is 25 to 30 ft. above the main seam. In high banks, this upper seam is followed by shale or shaly sandstone and 3 to 4 ft. of clay and surface material.

Opening pits at Betsy is done by a Bucyrus-Erie 225-B steam shovel with 85-ft. boom, 54-ft. sticks and 6-cu.yd. manganese dipper. It moves overburden up to 30 to 35 ft., which requires no shooting, and is accompanied by a 50-B steam loading shovel with 2-cu.yd. dipper. The main producing unit comprises a 550-B electric shovel with 97-ft. boom, 72-ft. stick and 17-cu.yd. welded "Man-ten" dipper, accompanied by two 29-T drills (9-in. tools) and a 52-B loader with 4-cu.yd. dipper. Auxiliary equipment includes a Sullivan compressor, two Caterpillar D-6 tractors with La-Plant-Choate bulldozers and an Adams Model 102 road maintainer. One 3-in. and two 2-in. gas pumps (Deming and Gorman-Rupp) handle water.

Cut width may reach 85 to 90 ft. on the outcrop, with the average approximately 50 ft. on succeeding cuts. A 30- to 35-ft. berm is left for haulage, making pit width 80 to 85 ft. Overburden is broken with L.O.X. in 9-in. cartridges (normal weight, 40 lb.; minimum, 36). Spacing of holes is adjusted so that charge is the same regardless of thickness of burden. Consequently, the minimum is 21 ft., while the average is 27. L.O.X. loading is based on a yield, in terms of equivalent black powder, of 7 cu.yd. per pound.

The pits are served by main haulage roads made of minus 1½- to 2-in. tipple refuse, topped with 4 in. of bank slag and dressed with 2-X slag. Five Dart tractors (198-hp. Hercules HXE gasoline engines) pulling 25-ton Austin-Western trail cars deliver 2,100 to 2,200 tons to the tipple per shift. Maximum round-trip haul is 5 miles and the average is 4. Haulage units were averaging 16 trips to the big loader at the time of the *Coal Age* survey and 11 to 12 to the small machine. Mileage per gallon of gasoline was 1½ in the first half of 1941. Tractor tires (9.75x24) have a life of around 20,000 miles; 13.50x24 trailer tires, 15,000 miles.

POWER AND MAINTENANCE

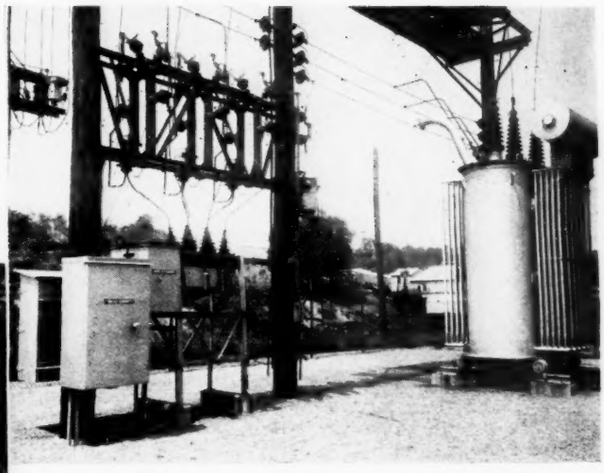
Eastern Ohio No. 8 Electric Strippings

SINCE most of the equipment at eastern Ohio No. 8 electric stripping operations has been built since 1935 it incorporates most of the design and safety features distinguishing late-type machines. Much of the digging is hard and the terrain hilly, but stitch-in-time maintenance has forestalled extensive heavy repair jobs on the larger shovels. Rope renewals and dipper-point changes are the routine maintenance jobs. The arc-welder, now the principal tool for most strip-mine repair jobs, is used for attaching manganese-steel tips and building up the sides of dipper teeth, as well as in other work.

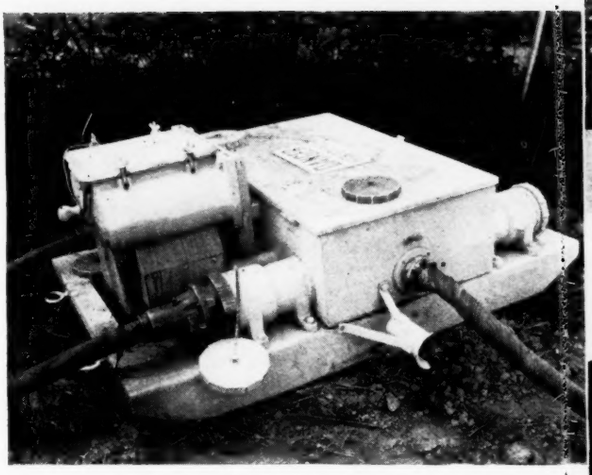
One of the three organizations operating electric strippers, the Hanna Coal Co., is now erecting a Bucyrus-Erie 550-B machine with 17-cu.yd. dipper to supplement the initial unit at Georgetown No. 12 mine—Marion 300-E with 8-cu.yd. dipper. The Industrial Coal & Iron Co. strips at Apex with a Marion 5560 shovel. Installed in 1935, this unit was designed for a 30-cu.yd. dipper, although, because of hard digging, present dipper size is only 16-cu.yd. Two years ago, The Jefferson Co. supplemented the original steam stripper at Betsy mine with a 550-B Bucyrus-Erie electric shovel with 17-cu.yd. dipper.

All three companies use 4,150 volts (nominal) for shovel operation and carry grounded neutral conductors from the star-connected secondaries of the transformers to the shovel frames. Both Hanna and Jefferson have installed General Electric ground-current limiting and protective equipment at the transformers. The resistor and reactor in the neutral ground at Georgetown No. 12 is designed to limit the ground current to 108 amp. full load. Current transformers are installed in two of the lines and in the neutral for tripping the circuit breaker. Maximum possible voltage from frame to ground is limited, according to specifications, to 100 to 125 volts. To make possible the installation of ground-protective equipment free of connection with the power company's 4,150-volt supply, a bank of three Pittsburgh insulating transformers (winding ratio, 1.73 to 1) connected delta-primary and star-secondary was installed at Georgetown No. 12.

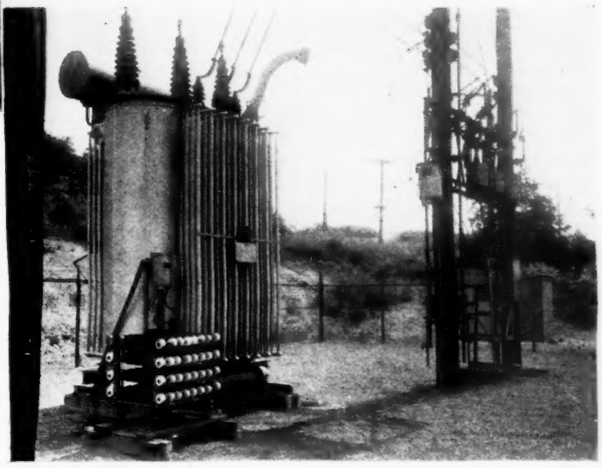
Ground-protective equipment at Betsy mine, however, is located at a 66,000-4,150-volt step-down transformer substation. A resistor and reactor are used and the oil switch kicks out if the ground current reaches 7½ amp. After a few seconds' delay the switch recloses automatically.



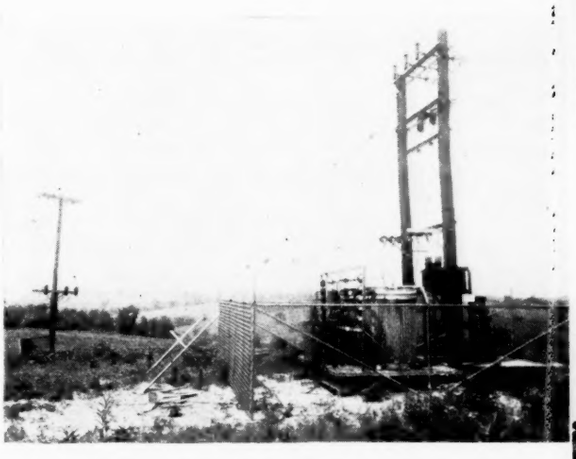
At the left are the overload and ground-protective relays and the oil switch feeding 4,150 volts to Betsy equipment. Resistor and reactor are back of the transformer, right.



Steel sled and junction box serving to connect the field cables and provide a feeder tap at Apex mine.

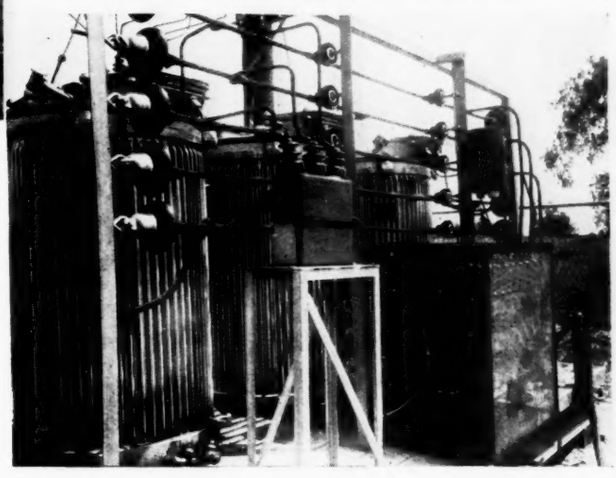


Ground-current limiting resistor and reactor at Betsy.

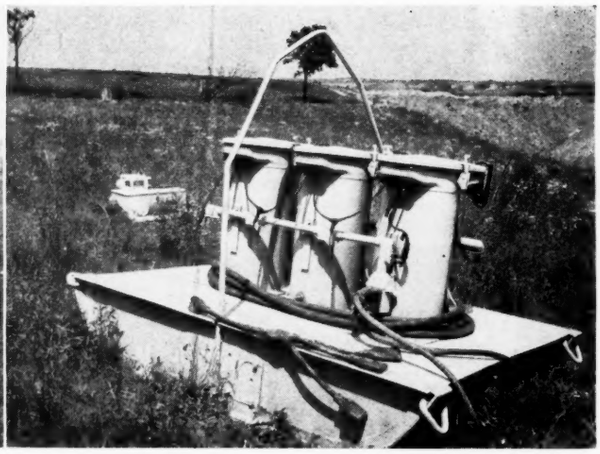


Insulating and ground-protective station in the 4,150-volt line supplying Georgetown No. 12 mine.

Georgetown No. 12's insulating transformers (1.73 to 1). Reactor and resistor are at lower right.



Field-cable and transformer station on the high wall at The Jefferson Co.'s Betsy mine.



Transformer station (4,150 to 440 volts) for drills, pumps and welder, Apex mine.

If it kicks out a second time, it is locked out, thus cutting power off the equipment until the trouble has been cleared. At Apex mine, where the ground current is not limited, the neutral conductor is grounded at each pole.

Field-cable distribution systems, in which cables several thousand feet in length are used between the ends of pole lines and the beginning of shovel trailing cables, are used at all three mines. In each case the junction boxes are General Electric steel-clad units mounted on steel sleds. At Apex, the field-cable equipment, installed in 1935, consists of four 1,000-ft. lengths of wire-armored cable without shielding over the individual No. 4 conductors. The same size wire is used on the pole lines feeding the field-cable system.

One 1,250-ft. and two 1,000-ft. parkway cables in use at Betsy have shielded conductors. Shielding also is a feature of the Georgetown No. 12 field cables. Indicative of the 4,150-volt loads, fusing at Betsy is as follows: 100-amp. in the main line and in the junction box feed to the 550-B stripper; 75-amp. to the loading shovel; and 25-amp. to the drill transformers.

Nominal length of trailing cables used on both stripping and loading shovels is 1,000 ft. A spare trailing cable 800 ft. long is kept on a reel on the high-wall ready for immediate application in case the 1,000-ft. regular stripper cable should fail at Apex mine. This spare cable has receptacle plugs already on it so it can be put into service quicker than a temporary splice can be made in the regular cable. In the newer trailing cables, as on the Marion 300-E machine at Georgetown No. 12, each of the three ground wires is in direct contact with the shielding of the adjacent conductor.

Although the hoist is counterweighted, the 5560 stripper at Apex is driven by a synchronous motor rated at 1,000 hp. In contrast, the 550-B machine at Betsy, also counterweighted and using a bucket 1 cu.yd. larger, is driven by a motor rated at 580 kva. On this shovel, the d.c. operating equipment consists of two 187-hp. hoist motors, two 75-hp. swing motors and one 75-hp. crowd motor. Both shovels were equipped by General Electric. Induction motors drive the generators of the loading shovels. The 52-B with 4-cu.-yd. dipper at Betsy is driven by a 125-hp. motor which, with other electrical apparatus, was made by Westinghouse. Because the synchronous stripper motors constitute the principal loads, these mines are able to maintain power factors at practically 100 per cent.

For auxiliary pit equipment, such as drills, pumps and arc-welders, 440 volts is standard at all three properties. The newest type of portable transformer substation in use at Apex consists of three General Electric 15-kva. units grouped closely on a small steel sled with primary cutouts and secondary receptacle attached to the transformers themselves. A bail attached to the sled and passing up over the top of the transformers provides a convenient hitch for lifting the substation with a shovel or crane. The 440-volt receptacle is a three-gang unit, thus accommodating three Miller plugs. The older-type portable substation used at

A bar similar to that lying on the dipper tooth is welded to the cutting edge with stainless electrode at Apex. Finishing welds (second point) are made with manganese electrode.

Frayed section of 1⅝-in. hoist rope which resulted in its removal from the 16-cu.yd. electric stripping shovel at Apex mine after handling some 1,000,000 cu.yd. of overburden.

the mine has only a single Miller receptacle, but two or three cables could be attached by using a one-to-three adapter.

Maintenance of the preventive type is indicated by the new appearance, inside and out, of the Apex stripper, although it has been in service over six years. Its boom has been let down but once, three years ago, for renewal of the foot casting. In 1940, loose rivets in the lower frame were replaced and the counterweight mechanism overhauled. Extra sets of pads, sprockets and other moving parts are kept on hand so that a "cat" can be replaced and the worn one rebuilt for another exchange. The same practice is followed with the loading-shovels' cats.

The 16-cu.yd. Apex dipper has a manganese-steel front and a cast-steel back, while the 3-cu.yd. loader dipper has a boiler-plate front and cast-steel back. Teeth on the stripping dipper are changed twice a week. Worn teeth are restored by welding a ¾-in. round manganese-steel rod across the point. Attachment is made with stainless electrodes but the second layer and tooth-side build-up is done with manganese-steel electrodes. New points are purchased from Marion. This tooth welding and other arc-welding at the property normally keeps two men busy, one on each of two shifts. Hoist ropes last an average of two months and maximum rope performance has been 1,000,000 cu.yd.

The 17-cu.yd. dipper at Betsy is "Manten" steel. New points are purchased from Bucyrus-Erie. Average 550-B rope performance has been as follows: hoist, 1,200,000 cu.yd.: counterweight, 1,000,000 cu.yd.; crowd, 800,000 cu.yd. During 2½ years of operation. renewal of one bearing and rebuilding of the base of the dipper have constituted the only major repair jobs.

Moved down from the Iron Range in 1939, the 300-E machine at Georgetown No. 12 has been subjected to an extensive rebuilding and reinforcing job on the frames and deck. Its boom, somewhat light for the digging and now developing loose rivets, will be let down and rebuilt when the new 550-B machine ("Manten" dipper) goes into service.

SMALL-UNIT STRIPPING

Eastern Ohio No. 8 Field

STRIPPING with small shovels and draglines, or with large tractor-powered scrapers, compares quite favorably in methods and results, considering equipment size, with those prevailing at the large electric operations in the eastern Ohio No. 8 field. Companies employing the small equipment, powered by internal-combustion engines, operate in the same locality and under the same conditions (hillside stripping, with occasional knolls or valleys). In contrast with 55 to 70 ft. at electric properties, however, the usual stripping limit at small-unit mines is 35 to 45 ft., although burdens as high as 60 ft. may be tackled under favorable conditions. Because heavy rock must be handled at times, shovels are most used.

Cutting in on the crop on hillsides and working back two, three or more cuts to the overburden maximum is the general practice. Knolls with not over 50 to 60 ft. of cover are prized locations, since they usually provide a relatively large acreage of hard black coal, which, with more favorable working conditions, often makes possible handling deeper overburden than usual. Wide valleys, although infrequent, also provide good opportunities for low-cost production, other things being equal.

Since the general practice is to develop ahead and keep two or more pits available for either stripping or loading, and moves to new locations are frequent, flexibility and mobility are major factors in equipment choice. Weight and size are kept down to permit ready movement from one place to another across country or over the public highways under the unit's own power, or, in long moves, by truck and trailer without major dismantling. Careful consideration must be given to pit layout to insure adequate spoiling room, a major problem with the organizations in question. Several use scrapers to take off the top and permit the mining of coal over areas with overburden a few feet thicker than the shovels can handle efficiently.

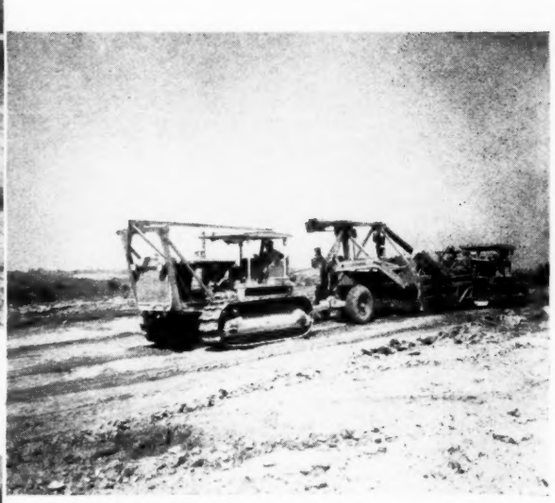
Modern Auxiliaries Used

Modern auxiliaries, such as vertical and sidewall drills, gasoline-powered pumping equipment, tractors and bulldozers, coal sweepers, road maintainers, etc., supplement stripping and loading equipment. Contract haulage is the rule, although some companies operate their own equipment. The usual haulage unit is a 1½- or 2-ton end-dump truck built up to hold 6 to 8 tons of coal. Railroad preparation plants, or truck plants in the field with loading ramps on the nearest rails (see p. 117) are operated by all organizations except those working on contract. Although not the complete list recovering the No. 8 seam in eastern Ohio, the following are presented as typical examples of small-unit stripping.

Three or more pits usually are kept available for operation by the Dye Coal Co., in addition to those in the development stage. At the time of the *Coal Age* survey, coal from one pit went to one of the company's two preparation plants, while coal from others went to either. First in the field to use sidewall drilling equipment, the power sweeper and the scarifier for removing bone on top of the coal (see p. 129). Dye strips with one Link-Belt K-480 shovel (Waukesha oil engine) with 34-ft. boom, 28-ft. stick and 1¾-cu.yd. "Amsco" dipper; one K-580 shovel (Waukesha oil) with 38-ft. boom, 30-ft. stick and 2-cu.yd. Pettibone-Mulliken dipper; and one Link-Belt 370 "Speed-O-Matic" shovel (Caterpillar diesel) with 28-ft. boom, 22-ft. stick and 1½-cu.yd. Pettibone-Mulliken dipper. The latter alternates between stripping and loading. An Allis-Chalmers HD-14 tractor (General Motors two-cycle diesel engine) with 7-cu.yd. Continental scraper reduces overburden thickness to shovel limits where necessary.

Loading equipment comprises a Bucyrus-Erie 37-B shovel (Wisconsin gas engine) with 1½-cu.yd. "Amsco" dipper and a Lorain 75-B shovel (Waukesha gas) with 1¼-cu.yd. "Amsco" dipper. With coal from the "Speed-O-Matic" combination machine, output from the three pits to the two tipples was running 1,500 to 1,800 tons per day. Auxiliary equipment includes a "Parmanco" hand-fed sidewall drill, Allis-Chalmers MW gas tractor with Baker bulldozer, and a W gas machine

Breaking up the hard material with rooter at the R. L. Griggs stripping.



One of the two R. L. Griggs scrapers being given a boost by the spare tractor in stripping on a knoll.

Loading with 1-yd. shovel in an R. L. Griggs hillside pit.

First step in pit-cleaning operations on the Fairpoint Construction Co. job at the Georgetown No. 12 operation.

After scarifying to remove bone (see p. 129) the coal is cleaned in Dye pits by this power-operated broom.

with blade and Hough broom for road work and coal cleaning. Water is handled by 2- and 3-in. "Homolite" and Jaeger gas pumps. Haulage is contracted.

Usual No. 8 thickness is 54 in. While hillside work leads, knolls are acquired where possible, since they provide a larger tonnage of better coal. The overburden limit, especially in hillside stripping, is around 40 ft., but occasionally (knolls and elsewhere at times) the limit may be raised to 50 to 55 ft. In knoll operation, the soft stuff on the top usually is taken off with the HD-14 tractor and Continental scraper and hauled outside the stripping area, leaving the remaining hard material to the shovels.

First cuts with shovels are made down to 5 ft. of cover and as wide as possible to facilitate blocking out merchantable coal and making arrangements for succeeding cuts, which average about 30 ft. A coal berm seldom is left, unless for some special purpose, the practice being to load the width of the pit. In preparing for loading, the scarifier (p. 129) rips up about 2 in. of bone, which is bulldozed off. The job is completed by the power broom.

Shooting overburden seldom is required until after the second or third cuts. Where necessary, the "Parmanco" machine puts in 6-in. holes averaging 24 ft. in depth. Spacing is varied, but the usual is about 21 ft. Atlas "Apex 1" (5½x16-in. sticks) is used in shooting. Charges range from 37½ to 100 lb. per hole, with the average about 60.

Shovel Put on Bench

In some cases the height of overburden handled by a shovel is increased by working from a spoil bench some 6 to 8 ft. higher than the coal. In this operation, the shovel fills out in the old cut and moves up on it so that the bank-side crawlers are about on line with the coal face. This puts it nearer the spoil location. Then the shovel starts digging down as far as it can, filling in in front and throwing the rest of the spoil against and usually on the preceding spoil. When finished, the shovel ramps back down on the coal and strips off the remaining 6 to 8 ft. or so, spoiling on the bench already made. This enables a shovel to handle 5 to 10 ft. more overburden than normal.

Pits are staked and yardage is estimated daily. "Servis" recorders are installed on each shovel, with an hour meter on the scraper tractor. Operating reports showing delays are submitted on shovel and scraper equipment. Yardage was running about as follows: 580 shovel, 2,500 in 21 hours; 480, 2,200; 370 "Speed-O-Matic," 1,200 in 14 hours (coal loading on the other shift); scraper, 1,200 in 21 hours. Ropes on the three strippers average 50,000 to 60,000 cu.yd.

Management, sales and preparation of government reports are concentrated at the main office at Dyco No. 1 plant, this centralized control making for flexibility and production where and when wanted. Maintenance is handled by a master me-

This stripping shovel, of three Dye machines, carries a 2-cu.yd. dipper.

Tractor-scraper unit developing for the Dye Coal Co. by taking off the top of a knoll in preparation for shovel work later. The hilltop in the background is next on the list.

One of two Dye loading shovels bailing up coal.

Stripping unit finishing up in the end of a pit in thick overburden at Dale mine.

Shown engaged in loading, this shovel at Brilliant mine also handles stripping.

Scraper engaged in opening a new hillside pit at Dale mine.

Loading on the Fairpoint Construction Co. contract at Georgetown No. 12 mine.

Loading in a Dale pit. The illustration also shows the vertical drill and how the surface material is removed with tractor and scraper.

chanic and chief electrician, with three helpers. Rigid daily inspections are supplemented by periodic replacement of parts to forestall breakdowns. Where possible, repairs are made by substituting a new equipment "unit," or assembly, taking the old to the central shop for repair and replacement of damaged parts and storage until again required.

Two Caterpillar D-8 tractors with 12- and 16-cu.yd. LeTourneau "Carryall" scrapers, supplemented by a third D-8 machine with "Angledozer" and "Rooter," are used for stripping by R. L. Griggs & Co. Loading is done with a 1-cu.yd. Lorain 75 shovel and ⅜-cu.yd. General machine. Hauling is contracted. Auxiliaries include an Ingersoll-Rand 105-A two-stage compressor (rock and other work) and 2- and 3-in. "Homolite" gas pumps.

Two, three or more pits are kept open or developing. Production is around 1,000 tons per day when loading. Usual coal thickness is 54 in. Normal stripping limit is 45 ft. With knolls, and occasionally in other work, the limit may be raised to 60 ft. The overburden consists of about 1 ft. of drawslate on the coal, followed by the "rider" coal (1 ft.), 1½ ft. of soapstone, 1½ ft. of clay and 10 ft. of sandy shale under the thin upper seam, followed by more sandy shale and boulders in the higher banks.

Use Rooters and Scrapers

Soft material is removed by the scrapers without further assistance, except for pushing by the spare tractor, when available, to raise the load per trip. In hardpan, hard clay and shale, the "Rooter" is called to plow them up. Occasional harder rock is broken up by vertical holes and 60-per-cent dynamite.

One-way scraper haul is kept, where possible, under 500 to 600 ft. Thus, in hillside work, fills may be made across the pit to shorten the haul to the spoiling site. In knoll work, if disposal space is available, the entire area may be stripped at one time, and in any case the top usually is taken off before cut operation is started. With one-way hauls of 400 to 600 ft., the two scrapers handle about 200 cu.yd. per hour.

Working for the Hanna Coal Co. at its Georgetown No. 12 operation, the Fairpoint Construction Co. was taking up to 35 ft. of burden to recover around 52 in. of No. 8 coal, hauled to the No. 12 preparation plant in the organization's own trucks. Stripping was being done with a Lima 1201 diesel shovel with 42-ft. boom, 35-ft. stick and 2½-cu.yd. Pettibone-Mulliken dipper averaging about 200 cu.yd. per hour. The Fairpoint organization also was preparing to open an independent operation, using a similar Lima, plus a second machine with 3-cu.yd. dipper.

Loading at Georgetown No. 12 was being done with a Lorain 80 machine (30½-ft. boom, 25-ft. stick and 1½-cu.yd. "Amsco" dipper), also used at times in opening up on the crop. Stripper and loader were assisted as required by an International T-40 tractor with Bucyrus-Erie "Bullgrader." A "Parmanco" sidewall unit was available for drilling banks more than approximately 28 ft. in height. Hole spacing is 12 to 18 ft. (cuts 40 to 45 ft. wide), with the usual as 16. The explosive is 5½x16-in. "Apcor" No. 1 or "Apex" No. 2. Charge per hole is 85 to 100 lb., making the average yield per pound about 10 cu.yd.

Width of the first cut normally is 60 ft. or more to show up drainage channels and block out the merchantable coal. Succeeding cuts, however, usually are 40 to 45 ft. wide. After cleaning with shovels and brooms, the coal usually is loaded the full cut width.

Piney Fork No. 4 stripping (Hanna) is one of the few dragline operations in eastern Ohio. Stripping and loading are done under contract by Rice Bros., using a Northwest Model 95 dragline with 75-ft. boom and 2½-cu.yd. bucket, Northwest 80-D shovel with 30-ft. boom, 25-ft. stick and 2-cu.yd. dipper, and a smaller Northwest Model 6 shovel with 1½-cu.yd. dipper. Auxiliaries include a Caterpillar tractor with LeTourneau "Angledozer," Hardsocg sidewall drill, pit pumps, Caterpillar No. 12 road patrol, etc. Dragline and shovels are powered by Murphy diesel engines. The 80-D machine normally is used for loading and also is available for stripping duty, while the smaller Model 6 generally works in tandem with the dragline in stripping.

Normal stripping limit is 30 to 35 ft.

Fairpoint Construction Co. stripping shovel (2½-cu.yd. dipper) opening up on the outcrop at Georgetown No. 12.

View of the storage bin and drift opening at Piney Fork No. 4, showing part of the Rice Bros. dragline and shovel equipment (not in their usual type of work when this illustration was made).

The first cut generally is 60 ft. wide. Second, third and succeeding cuts, if any, are 30 to 35 ft. wide. These generally have to be shot, using chiefly black powder with a dynamite core. The holes in most cases are drilled on 19-ft. centers and slant upward from just over the "rider" coal to just under the limestone some 7 ft. over the main seam.

In tandem stripping, particularly after the first cut, the Model 6 shovel and "Angledozer" take off the top, usually down to and including the thin upper seam 15 to 20 ft. over the main seam. Both machines spoil in the previous cut, already loaded out. The dragline follows along behind on the bench made by the other units and spoils the remainder of the burden down to the coal across the pit.

Coal is hauled through Piney Fork No. 1 deep mine to the preparation plant on the third shift. To facilitate this operation, bins are built at drift openings to receive the strip output. The present bin has a capacity of 1,000 tons. Trucks dump into a small hopper from which the coal is fed out into the main bin by a Jeffrey conveyor. Two reciprocating feeders in turn place the coal in mine cars.

First to introduce small shovels and trucks into the field about 1930, the Rail & Lake Coal Co. now operates two stripping properties. Equipment at Dale comprises a Marion 40-A diesel shovel (Buda engine) with 45-ft. boom, 36-ft. stick and 2½-cu.yd. manganese-front dipper; Marion 381 loader with 2-cu.yd. dipper, "Parmanco" sidewall and Loomis K-4 vertical drills, Caterpillar D-7 and D-8 tractors with LeTourneau "Angledozers," 2-in. "Homolite" gas pumps and (with the D-8 machine) a 13-cu.yd. LeTourneau "Carryall" scraper for opening up pits and assisting the shovel in deep cover by taking off the top down to the hard material. Average output is 500 to 600 tons per day (one loading shift). Hauling is done on contract, using end-dump trucks similar to those at other operations.

Strip to 35 to 45 Ft.

Seam thickness is 54 in., and the immediately overlying material comprises the usual drawslate, "rider" coal and rotten lime. The stripping limit generally is 35 to 45 ft., while the acreage per setting varies from 3 to 30. In the higher banks, the "Carryall" may be used to take off 10 or 15 ft. of soft top strata. Usual cut width is 30 to 35 ft. and a berm of 10 to 18 ft. may or may not be left for the trucks, depending upon the spoil room available.

Drilling usually is not required with cover less than 28 ft. Up to 35 ft., the sidewall machine is employed, and over 35 the vertical machine is used, since vertical loading is more effective in breaking up sandstone and shale high in the bank. Spacing of both sidewall and vertical holes usually is 25 ft. With 28 ft. of cover, charge per hole, 25-ft. spacing, is around 75 lb. (5x18-in. "Apcor No. 1"); vertical holes, 35 ft. or more cover, 100 to 125 lb.

With a similar coal thickness and overburden conditions, usual stripping limit at Rail & Lake's Brilliant mine is 30 to 35 ft. Stripping and loading are done alternately by the same machine, a Marion 381 with 32-ft. boom, 26-ft. stick and 2½-cu.yd. manganese-front dipper. A D-7 tractor with "Angledozer" and 7-cu.yd. "Carryall" scraper is used in taking off up to 10 ft. of top material ahead the shovel to increase output. Average cut width is 30 ft. and the coal usually is loaded completely. When shooting overburden is required, the "Parmanco" sidewall machine is moved from Dale and similar practices are followed. Output, hauled on contract, runs 700 to 800 tons per day of one loading shift.

STRIP RECLAMATION

In Eastern Ohio

CONTINUING and expanding earlier individual work, the Ohio Reclamation Committee, "an enterprise carried on by the open-cut mining industry of Ohio to restore the marginal surface lands directly connected with open-cut operations," was organized in December, 1940, with William L. Burt, vice president, The Jefferson Co., as chairman. In the first half of 1941, under the committee's auspices, an area equivalent to 43 per cent of the total stripped in that period was planted, in addition to other work designed to make stripped land yield a return either in cash or in fishing, hunting and other recreational facilities. The goal in coming years, aside from other activities, is planting substantially in excess of 100 per cent of the acreage worked so as to include eventually all stripped areas in the program, as well as certain closely associated marginal lands not suitable for farming.

The reclamation committee was formed by the Hanna Coal Co., Harmon Creek Coal Corporation, Industrial Coal & Iron Co. and The Jefferson Co. Membership is open to any stripping company in the State, and adherents since organization include the Dye Coal Co., Marshall Mining Co. and James Bros. All but Marshall and James Bros. are mining the No. 8 seam in Harrison and Jefferson counties. The committee works closely with the U. S. Soil Conservation Service, Ohio Division of Forestry and other State and federal organizations, receiving the benefit of their advice and assistance, and in turn cooperates with sportsmen's and farmers' groups and other local organizations in planning reclamation work, particularly from the standpoint of recreational and game-propagation activities.

Work is in charge of a full-time director. Areas to be planted are selected by the director with the help of the coal company. The director makes an estimate of the number of trees, if tree-planting is to be done, and orders them from the Ohio Division of Forestry or the Soil Conservation Service. Price to the committee is the same as to farmers, or slightly more than cost. The usual figure is $6 to $8 per thousand, with the minimum as $4. The highest price ($8) is paid for four-year-old stock. Cost of planting labor is approximately 1.4c. per tree.

All costs for trees, planting labor, etc., are paid by the committee, which then bills the coal company for the work. Under this arrangement, the company is relieved of the necessity of rounding up planting crews and interrupting other work to do the job. Also, planting labor is kept off the payrolls of the coal companies, relieving them of that much of the tax and bookkeeping burdens they have to bear.

Most tree-planting to date has been

Inter-bank red-pine planting at Betsy, with hardwoods on spoil in background. Swamp in foreground eventually will be part of a lake for propagating ducks.

Wild mallard hens on lake on Betsy property—also stocked with fish.

Black locust two to three years old on steep bank, Dye Coal Co.

Sweet-clover planting for pasturage on old bank at Apex mine, Industrial Coal & Iron.

Four-year red pine (two years in bed, two years transplanted) set out in April, 1941, at Georgetown No. 12 mine of the Hanna Coal Co.

Rose Valley lake, made by damming old pit (spoils 13 years old). The lake is stocked with bass and bluegills. The right bank has been planted with red and short-leaf pine; the left with jack and Scotch pine, with red oak under the stand of locust at the left.

done on old banks, although plans call for planting areas between banks and other marginal lands not suitable for farming. Considerable inter-bank planting already had been done by The Jefferson Co., which started reclamation work in 1938. Planting in the first half of 1941 under committee auspices totaled approximately 200,000 trees in addition to experimental plantings of forage and pasture crops, such as alfalfa, red and sweet clover, etc. Approximately 80 per cent of the trees are expected to survive.

Plantings to date have been largely conifers, although some hardwoods have been set out, including locust stands on certain steep banks, not only because of their suitability to such terrain but for their ability to reduce erosion. Locust plantings, however, are expected to be limited, since they are subject to borer attacks when young and thus find it difficult to get past the first few years. Conifers fit best into the program of insuring a cash yield within a relatively short time (15 years or less) and also are the logical plantings from the standpoint of the plant-succession cycle, preparing the ground for future hardwood growth. The planting program of the stripping companies, incidentally, is the first expenditure of money on forestry work by any private industry in Ohio.

Making available to the public as soon as possible additional hunting, fishing and recreational areas in a rather heavily populated section is another major committee activity designed to bring stripped areas into early use. High on the list is construction of lakes with or without supplementary hunting preserves. After stocking, such lakes make good fishing grounds. One company makes use of a lake in the propagation of ducks and produced over 60 young mallards this year. This company also has turned over to the Jefferson County Sportsmen's and Farmers' Association another lake with surrounding land (leased at $1 per year) for recreation, fishing and hunting. This association has done considerable work in planting vegetation and improving the tract for the propagation of wild life. Another coal company will turn over to the Boy Scouts a newly planted tract and lake, and will continue to assist in the construction of camping and recreational facilities.

Activity on the part of the committee and its members is supplemented by the activities of such independent organizations as the Spoil Banks' Council, formed in 1940 by sportsmen and farmers in the region with the Jefferson County Agricultural Agent as secretary. No contributions are required, and the organization has as its object the solution of problems which may affect its membership as a result of stripping activities, as well as promoting utilization of stripped areas as sites for hunting, fishing, picnicking and other recreation.

The Spoil Banks' Council held its third meeting on July 29 after a tour of planting and lake projects. Topics scheduled for discussion were reclamation in Indiana (colored movie); progress of the Ohio Work, by Jay Littlepage, director, Ohio Reclamation Committee; "The National Park Service and Coal-Strip Areas," by Harley L. Potter, field representative; "Fish in Spoil-Bank Lakes," by Charles McIntyre, fish management agent, Ohio Division of Conservation, and a discussion on utilization of spoil-bank areas.

Planting of field between banks at Betsy mine, Jefferson Co., showing jack and red pine after third growing season. Bank in background also has been planted.

SURFACE PREPARATION

Eastern Ohio No. 8 Field

EASTERN OHIO NO. 8 mechanical and strip mines are served by preparation plants ranging from simple two-track installations shipping lump and resultant up to elaborate washing, screening, drying and mixing plants producing a variety of sizes and mixtures. A few strip operations send some coal to washing plants already built to serve deep mines. Otherwise, preparation at these properties is by hand-picking, screening and crushing. Crushing is an important element in preparation at most stripping operations. In addition to regular crushing for stoker, screenings, etc., these mines process the softer stained first-cut and similar coal by breaking it to make railroad and special industrial fuel. Strip properties normally treat stained soft coal as a separate product from the regular hard black coal, loading and preparing it individually where possible.

Most of the conveyor mines installed such equipment within the last two years. Those adopting the hand-loaded type, which permits the same attention to picking at the face, have found little difference in their cleaning problem from hand loading into mine cars. Operations using duckbills, however, have been faced with a more difficult picking problem on the surface, necessitating, in many cases, more labor. Consequently, interest in mechanical cleaning is keener in this group, as well as among those contemplating the addition of duckbills.

Washing Plants Installed

The majority of the mobile-loader operations, as well as one mine using mobile machines for development and conveyors in rooms, are equipped with washing plants to insure a cleaner, more uniform product, particularly in the smaller sizes impossible to hand-pick. At the same time, transferring cleaning to the surface makes possible a higher underground efficiency, in addition to economies in preparation itself, as in picking labor.

Aside from mine-run, crushed coal and mixtures, the usual primary sizes at most of the mines covered by *Coal Age* are lump, egg and screenings. Stoker, reflecting the increased importance of this product, is a fourth size at several properties. Other sizes include nut and pea. The growing popularity of the smaller sizes is reflected in more vibrating screens in service. Several operators have installed tramp-iron magnets.

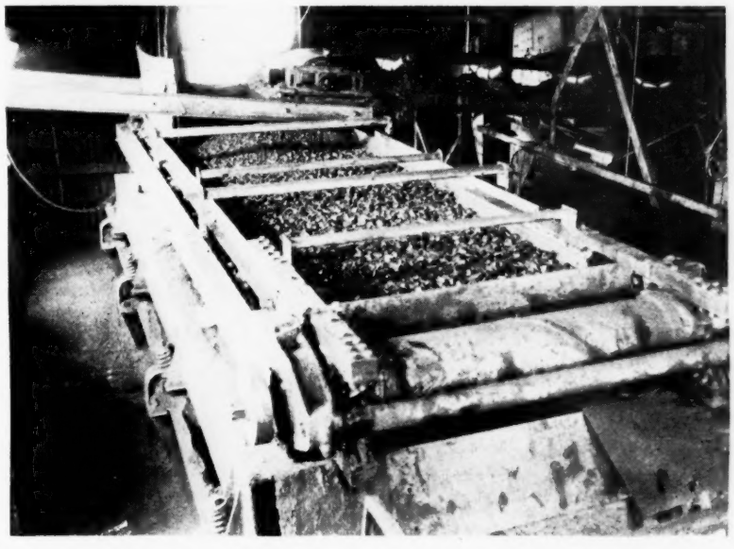
No. 8 stripping operations precede tipple preparation with careful cleaning in the pit (see articles beginning on pp. 103 and 109). Bulldozers remove the heavy stuff, and are supplemented by scarifying to take off rash in at least one case. Final cleaning takes in hand shovels, brooms, power brushes, air, etc.

Two plants on different railroads serve the Dye Coal Co. strippings, making shipping arrangements more flexible and preventing blocking. Stained coal, for example, may be hauled to one and hard black coal to another. Or if one plant has a breakdown, shipments can be continued from the other, etc. Dyco No. 1 is equipped with two dump hoppers, one feeding directly to the main conveyor to the Morrow shaker and another to an 18x20 Link-Belt crusher and then to the main conveyor. Picking is done ahead of the screen and on the lump loading boom. Three loading tracks are provided, and one is supplemented by a conveyor extending uptrack to permit loading lump, egg, pea and slack at one time.

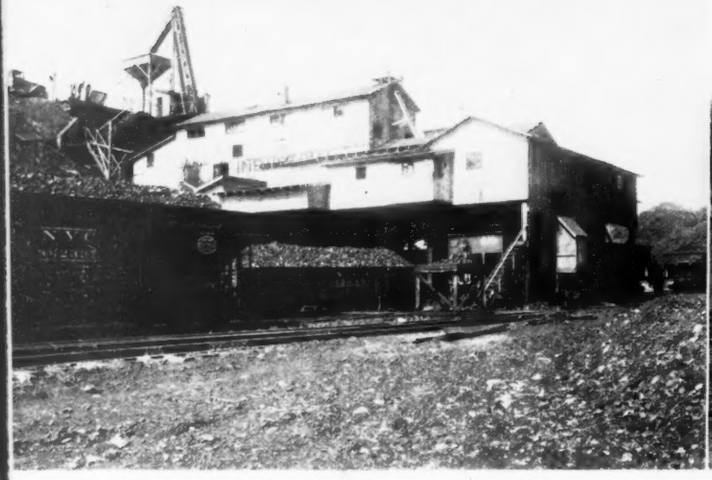
Coal at Dyco No. 2 is fed out of the single dump hopper onto an apron-type picking conveyor and then onto a Morrow shaker making lump, egg and slack. A 20x24 double-roll Scottdale crusher is installed for use as desired. The three sizes may be loaded simultaneously by means of an auxiliary conveyor over one of the two tracks.

Piney Fork No. 4 stripping output is prepared in the Piney Fork No. 1 plant, Hanna Coal Co., described briefly later in this article. This coal (p. 113) is stored in bins on the outcrop and fed into mine cars for transportation to the plant. Also, coal from Hanna's Georgetown No. 12 stripping may be shipped to Dun Glen No. 11. However, a two-track Morrow plant permits shipments direct—mostly mine-run and crushed coal, although a vibrating screen permits making lump and resultant. One picking table-loading boom for cleaning and loading lump or mine-run may be raised to feed into a Jeffrey single-roll crusher.

Apex mine, Industrial Coal & Iron Co., is served by a three-track plant designed to prepare lump, egg, screenings, mine-run, crushed coal and, by changing plates on the main screen, 1¼x¾-in. stoker. Trail-

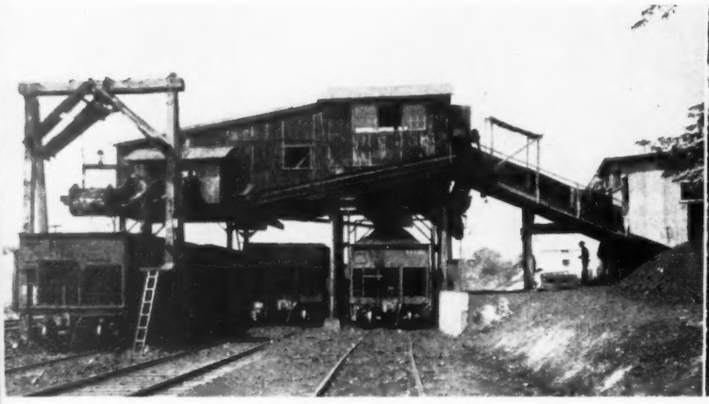


Vibrating screen installation at Wheeling Township No. 2 mine, one of several for stoker production.

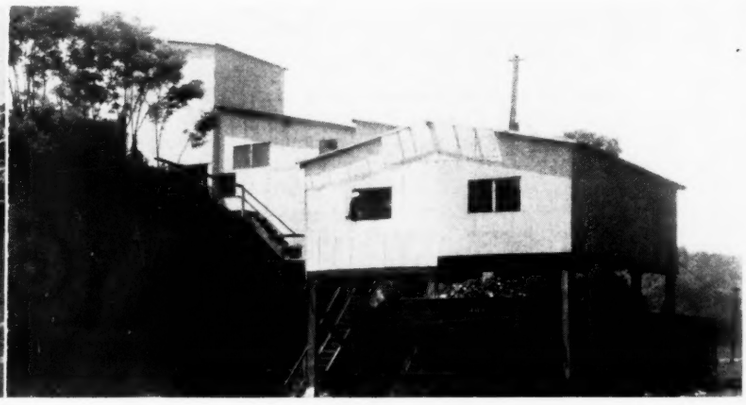


Industrial Coal & Iron Co.,
Apex preparation plant.

Georgetown No. 12 plant,
Hanna Coal Co.



Dyco No. 1 preparation plant,
Dye Coal Co.



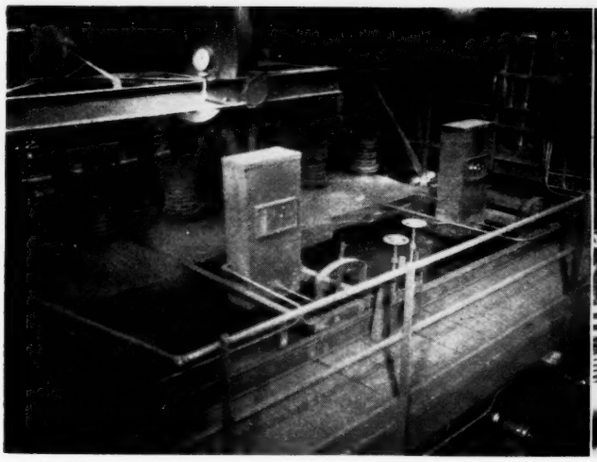
Dyco No. 2 preparation plant,
Dye Coal Co.

Betsy-mine plant, The Jefferson Co.

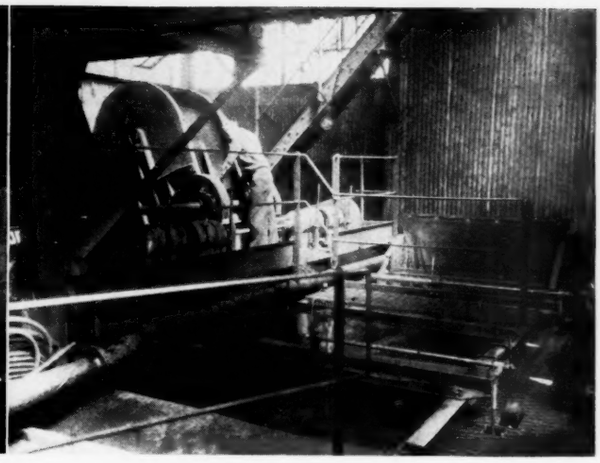
Dale plant, Rail & Lake Coal Co.

Brilliant plant, Rail & Lake Coal Co.

Preparation plant, Waco Colliers, Inc.



Minus 4-in. coal is cleaned in this washer at Willow Grove No. 10 mine.



Washer for 5x⅜-in. coal at Blaine mine, Lorain Coal & Dock Co.

ers at Apex dump into a 100-ton bin feeding an apron conveyor to the mine-run screen. This screen separates the feed into fine, intermediate and coarse sizes. Intermediate falls onto an apron-type picking conveyor, and the coarse coal is deposited on top, facilitating picking. Fines go either to the railroad car or join the other coal, after picking, on the Morrow sizing screen for separation into lump, egg and screenings, plus stoker on occasions. Two loading booms, also with picking facilities, are installed. When desired, the coal is sprayed with "Procite," applied to improve burning characteristics. A Jeffrey single-roll crusher makes possible breaking all coal larger than 2 in. to smaller than 2½ to 3 in.

Trailers Dump in Bin

Trailers at The Jefferson Co.'s Betsy mine dump into a 250-ton bin feeding a 36-in. Jeffrey belt conveyor (Boston Woven Hose & Rubber Co. belt). The conveyor discharges to a bar screen splitting the mine-run into plus and minus 2½-in. fractions for picking on separate tables. Recombined, the two are fed to the main shaker for separation into lump, egg, nut or stoker, and screenings, loaded on three tracks. Booms with picking facilities are provided for egg and nut. Mixtures up to and including mine-run are made on the screen. A 30x30 Jeffrey crusher is used in breaking soft stained coal to minus 2 to 2½ in. for steam use. Fines sizes may be treated with "Procite."

Dale stripping, Rail & Lake Coal Co., is served by a two-track plant (Morrow shaker) making various sizes of lump and screenings, plus railroad fuel (Jeffrey single-roll crusher), etc. Coal is fed out of the truck hopper, onto an apron conveyor on which it is picked and discharged onto the screen or into the crusher, also arranged to receive lump from the screen. At the company's Brilliant plant (steel construction), trucks dump into a bin feeding an apron conveyor on which picking also is done. Similarly, the coal goes into a crusher, arranged to receive lump also, or onto a shaker screen making lump, egg, nut and screenings. Mixtures also may be made on this screen, while a vibrating unit is installed for stoker. The various sizes go into five bins, from which they are trucked to a loading ramp on the railroad.

Waco Colliers, Inc., which prepares coal from the R. L. Griggs stripping, operates a three-track plant equipped with a combination board-hung screen and picking table separating the coal into lump, egg and slack. The former is loaded over a scraper-type boom. A Symons horizontal vibrating screen is used to make stoker from screenings, the resultant going to a bin for separate loading.

The Witch Hazel deep-mine plant, Florence Coal Co., is preceded by a 50-ton bin. A shaker screen separates the output into lump, egg and screenings. Two picking table-loading booms are provided for cleaning and loading the first two. Equipment also includes a tramp-iron magnet for mine-run.

With mine-run the principal size, a magnet is installed on the end of the lump boom at Rail & River No. 3 mine, Rail & River Coal Co., since this boom receives all the other sizes in loading mine-run. Screening equipment, however, permits shipment of lump, egg, nut and screenings, if desired. All coal over 2 in. is hand picked.

Four loading tracks serve the Mine No. 6 plant, J. H. Somers Coal Co., equipped with a Morrow unit for lump, egg and screenings or lump, egg, stoker and screenings. Or after picking, the coal may be loaded as mine-run on a belt which can discharge to a chute to an apron boom or to the shaker. Lump and egg are delivered to the picking sections of their respective loading booms. When stoker is produced, it may be loaded directly or run to a bin for truck shipment.

Lump, egg and screenings are the primary sizes made in the Heyl & Patterson plant serving Crow Hollow No. 1 mine, United States Coal Co. Equipment includes a crusher for breaking lump to make railroad fuel. Mine-run goes onto a preliminary picking table and then to the main screens. Lump and egg are further picked on two picking table-loading booms. A tramp-iron magnet (Hocking Valley Mine Supply Co.) is installed on the egg boom.

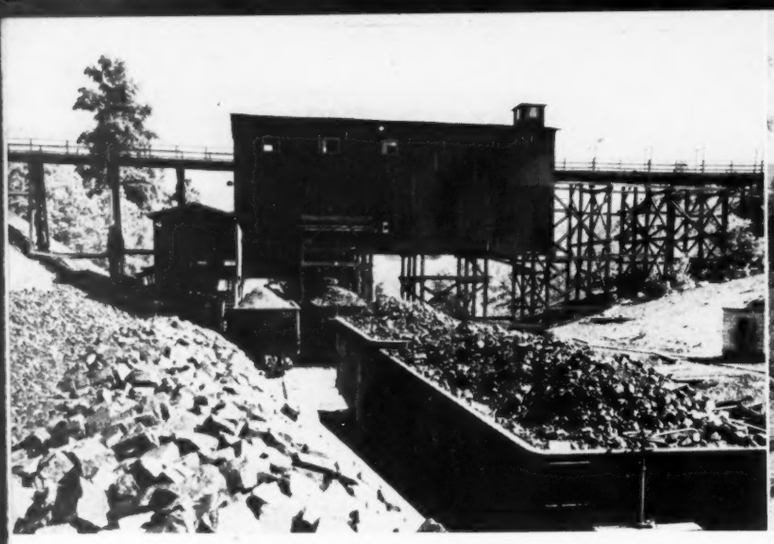
Mine-run at the Camel Run operation, Warner Collieries Co., served by a four-track Roberts & Schaefer plant, is passed under a mine-made suspended magnet on its way to a Marcus screening and picking unit making lump, egg and slack. The latter may be rescreened in a new addition, including a Tyler 400 electric screen, to make stoker. From the Marcus, lump and egg go onto picking table-loading booms for final preparation.

Tipple Has Three Tracks

A three-track Heyl & Patterson plant with Morrow additions prepares coal from Dorothy mine, Youghiogheny & Ohio Coal Co. Lump, egg and nut-and-slack made on shaker equipment are supplemented by modified and mixtures, the latter made in a mixing conveyor. Two picking table-loading booms are provided for lump and egg. A Jeffrey single-roll crusher breaks down any or all sizes up to and including mine-run, when desired.

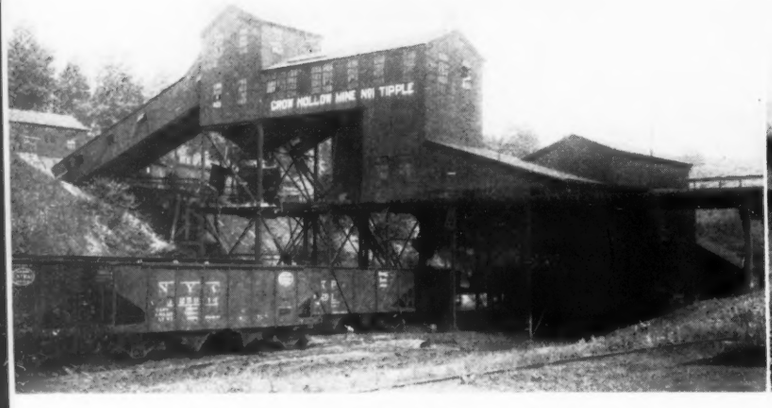
Output at the No. 2 mine, Wheeling Township Coal Mining Co., is prepared in a Fairmont plant with additions and changes. Fairmont shakers plus a Symons 5x14-ft. vibrating screen separate the coal into various sizes of lump, egg, nut, stoker and screenings, which may be mixed as desired. Two picking tables are provided for sizes larger than 2 in. Two Link-Belt (48- and 32-in.) and one 26-in. Fairmont belt booms are provided for loading. Other equipment includes an American Pulverizer Co. ring mill and a Pennsylvania & West Virginia tramp-iron magnet.

Five of the eastern Ohio No. 8 mechanical mines are equipped with washing plants. Equipment at Piney Fork No. 1,



Witch Hazel preparation plant,
Florence Coal Co.

Rail & River Coal Co. No. 3
preparation plant.



United States Coal Co. plant,
Crow Hollow No. 1

Preparation plant, Mine No. 6,
J. H. Somers Coal Co.

Camel Run plant, Warner Collieries Co.

No. 2 plant, Wheeling Township Coal Mining Co.

Dorothy, Youghiogheny & Ohio Coal Co.

Willow Grove No. 10 mechanical plant, Hanna Coal Co.

Hanna Coal Co. (under construction at the time of the *Coal Age* field work), includes a Link-Belt air-pulsated jig for 6x1¼-in. coal, an additional jig of the same type for 1¼x0-in. coal, settling tank for fines, two Link-Belt screen-type heat dryers for 1¼x⅛-in. washed coal, and an Elmore continuous centrifugal dryer for minus ⅛, which will be remixed with the heat-dryer output. Final screening, mixing and loading will be done in the original Jeffrey tipple.

Four primary sizes and combinations thereof, as well as special sizes derived from crushing, etc., are produced by Hanna's Willow Grove No. 10 plant, designed and erected by Link-Belt and equipped with a washer, centrifugal and heat dryers, special stoker-coal mixing equipment, etc. Coal and drawslate are loaded together at Willow Grove and are dumped into two 150-ton hoppers, with a third 50-ton unit for straight rock, which goes directly to the disposal equipment. From the hoppers variable-speed feeders move the raw coal out onto a flight conveyor.

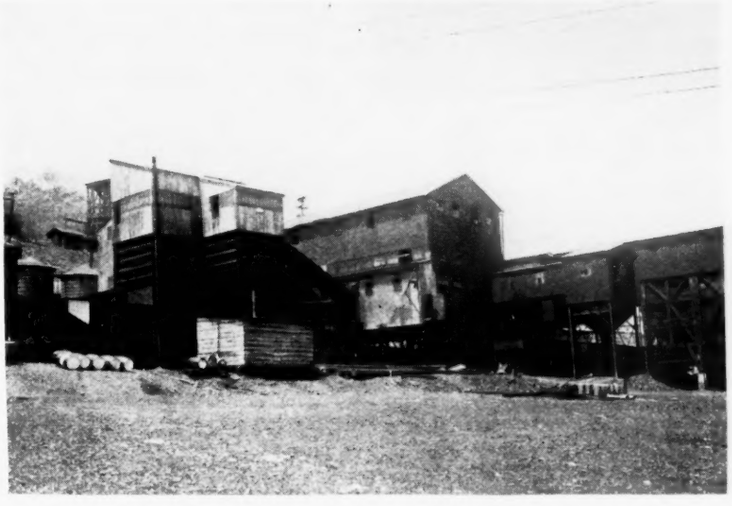
Rock Scalped Out

The conveyor discharges onto a bar section, over the regular shakers, which diverts large chunks of coal and rock to a special separating platform (see p. 130). Coal is returned to the screen and the rock chuted to the main refuse conveyor. The screens are welded and equipped with special jacket hold-downs. They separate the mine-run into plus 4-in., a screenings fraction up to 1¼ in. in size and an intermediate residual size. Normally, all coal under 4 in. goes to a Link-Belt air-pulsated jig, although provision is made for bypassing material from ½x0 up to 1¼x0 when desired for loading raw or in combinations.

Plus 4-in. coal goes onto a flat-apron picking conveyor. Banded pickings are crushed to minus 2 in. and returned to the washer feed. After passing over a degradation screen, the 4-in. lump is delivered to a flight-type loading boom or a double-roll coarse-coal crusher prior to return to the mixing equipment, either with or without passing over a vibrator to remove oversize for recirculation.

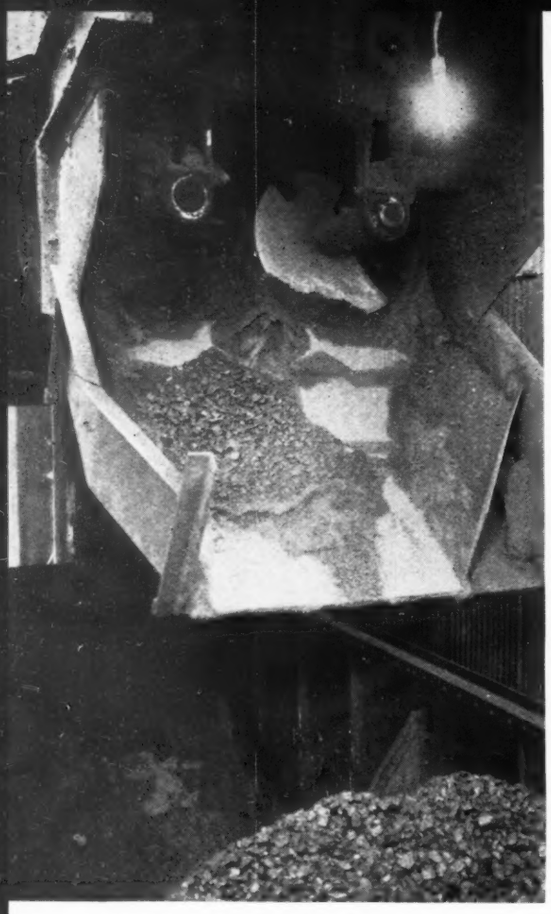
The Willow Grove jig is equipped with three refuse draws and two elevators. Draws at the middle and discharge are controlled by electric eyes. The feed-end draw, however, is controlled manually, because the heavy slate and rock concentrated at this point makes such control more suitable. Refuse from both elevators is discarded. Cleaned coal goes onto classifying shakers for separation into 4x2-, 2x1½-, 1½x½-, ½x⅜- and minus ⅜-in. sizes. All down to minus ⅜ may be loaded directly or used in making combinations, and all above 1½ in. may be run to the coarse-coal crusher for reduction and recirculation. The minus ⅜ normally goes to a Dorr thickener (or classifier), where minus 28-mesh material overflows. The ⅜in.x28-mesh product then may be dewatered on vibrating

Dun Glen No. 11 mechanical plant, Hanna Coal Co.



Blaine mechanical plant, Lorain Coal & Dock Co.

Powhatan Point mechanical plant, Powhatan Mining Co.



Small sizes at Willow Grove No. 10 are loaded through this paddle mixer.

equipment and used in making combinations or delivered to a 26-in. Elmore continuous centrifugal dryer and then either returned or routed to a Link-Belt "Roto-Louvre" heat dryer for further treatment.

The "Roto-Louvre" dryer handles ½x$\frac{3}{16}$-in., $\frac{3}{16}$-in.x28-mesh or ½-in.x28-mesh material, more frequently the latter, in which case the $\frac{3}{16}$-in.x28-mesh first goes through the centrifuge to relieve the heat unit of that much water load. Input to the centrifuge normally contains about 30 per cent surface moisture, while the output runs 5½ to 6 per cent. The heat dryer is operated to take the surface moisture of the ½-in.x28-mesh product down to the verge of dustiness, usually about 3 per cent. Or, if the coal is to be used in stoker shipments, the moisture is adjusted so that the combination of 1½x½-in. and ½-in.x28-mesh will have a surface moisture of about the same figure.

Mixing equipment at Willow Grove is required to handle, at times when the dryers are operating, both wet and dry coal. On occasions, it also receives broken material from the coarse-coal crusher. Mixing is done on a shaking distributing chute and in the main "slack" conveyor, supplemented by a horizontal paddle mixer (two screw conveyors in a steel trough) for the finer sizes, such as stoker. This paddle mixer insures thorough combination of all the fractions and prevents segregation.

Wear Protection Provided

Loading booms are provided for lump, egg and nut. Stoker and slack are loaded through the paddle mixer. In addition to welded screens, liberal use of corrosion- and wear-resisting screen plates and the like, all conveyors, feeders, chutes and launders are furnished with renewable liners for the bottoms and also the sides where necessary. Special steel is used in track sides and wearing bars for conveyor chains, and various other measures (October, 1937, *Coal Age*, p. 65) are taken to reduce maintenance cost and eliminate stoppages. Ducts to crushers, certain raw-coal screens, etc., with Robinson exhauster equipment, are supplemented by a United States-Hoffman vacuum-cleaning system, also taking in the dump house and office building.

Designed and erected by Morrow, the Dun Glen No. 11 plant, Hanna Coal Co., also is equipped to take coal from the Georgetown No. 12 stripping through a track hopper and scraper conveyor feeding the main screen. The plant includes picking tables, washer, shaker and vibrating screens, three loading booms, four loading tracks and five loading points. Usual sizes are 4-in. lump (others as desired), 4x1¼-in. egg, 1¼x¾-in. stoker and ¾-in. slack, plus 4x2, 2x1¼, etc., and other combinations, including those with proportions definitely fixed.

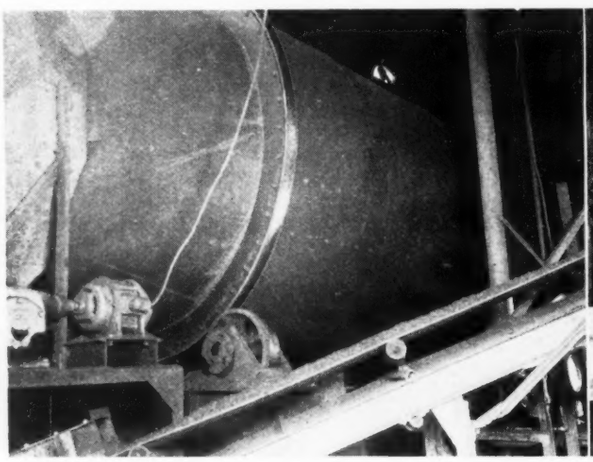
Coal from Dun Glen No. 11 mine, high on the hill, is dumped into a 30-ton hopper which feeds a 200-ton storage bin. A long Robins lowering conveyor (U. S. Rubber belt) brings the coal from the latter down to the plant and delivers it to the main screen. This screen makes plus and minus 4-in. sizes, the former going to flat-apron picking conveyors and then to shaker screens. These screens ordinarily are used to remove degradation (minus 2- or 4-in.) but also may be employed in sizing, such as making an 8-in. lump and 8x4-in. furnace, etc.

Minus 4-in. made on the main screen passes over a Ruston magnet on the lower deck and then onto two 4x12-ft. Symons horizontal vibrators (Ton-Cap cloth). These screens (also receiving lump degradation) separate the coal into 4x¾- and ¾x0-in. fractions, the former going to a Link-Belt air-pulsated jig originally used in the Fairpoint No. 9 plant. All refuse is discarded. Cleaned coal flows with the water to classifying screens for separation into 4x2, 2x1¼-, 1¼x¾- and minus ¾-in. (degradation) fractions. Gates, arranged for proportioning, permit making any desired combinations to which may be added raw ¾x0 from the Symons units.

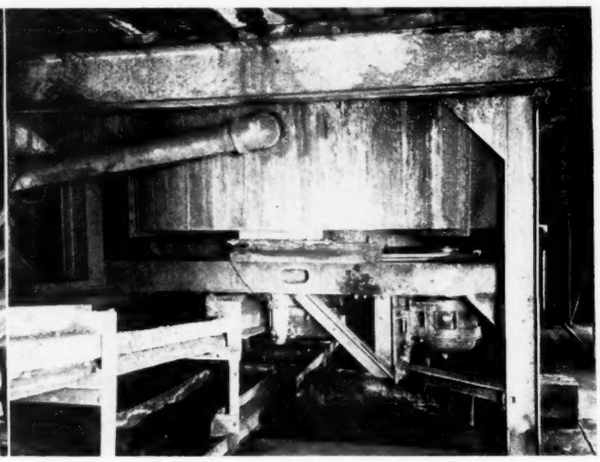
Water and Fines to Tank

Minus ¾ and water through the classifying screens flow to a steel settling tank. The coal is removed and dewatered by a drag conveyor for combination with raw ¾x0 or in other mixtures. Tank overflow is pumped to a settling cone (Morris centrifugal). Clarified water returns to the washer by gravity.

Washing of 5x⅜-in. coal in a Jeffrey addition to the original plant was inaugurated at Blaine mine, Lorain Coal & Dock Co., in 1939. Mine-run is delivered to the original shaker screens for separation into plus and minus 5-in. sizes. The 5-in. lump goes onto a picking table-loading boom, which may be raised to discharge



This heat dryer at the Willow Grove No. 10 plant handles coal up to ½-in.



A continuous centrifuge dewaters 3/16-in.x28-mesh at Willow Grove No. 10 mine.

into a mixing conveyor arranged to carry lump and other coarse sizes to a 36x36 single-roll Jeffrey crusher. The crushed product is discharged to the bottom strand for separate loading, mixing or transportation to the washer-feed conveyor.

Minus 5-in. coal from the main shakers, plus crushed material, is elevated (inclined scraper) to three Jeffrey-Traylor vibrators (piano-wire cloth) to remove minus $\frac{5}{8}$-in. fines. These drop into a slack bin, from which they may be loaded or run to a transfer conveyor back to the main four-compartment washed-coal conveyor. A second bin was installed for loading such sizes as 2x1$\frac{1}{4}$, $\frac{3}{8}$x0 or modified 2x0. Both are downtrack far enough to permit double loading on two of the three tracks, making it possible to load five sizes at a time.

Coal to Four-Cell Jig

The 5x$\frac{3}{8}$-in. from the vibrators is discharged to a Jeffrey four-cell two-compartment Baum-type jig. Material up the primary elevator goes to the bank. Material up the secondary elevator is delivered to a small bar screen. Material through the screen (1$\frac{1}{4}$- to 1$\frac{1}{2}$-in.) is chuted to a middlings crusher for reduction to approximately 1$\frac{1}{4}$-in. and return to the washer.

Washed coal flows with the water onto classifying screens for separation into 5x2-in. egg, 2x1$\frac{1}{4}$-in. nut, 1$\frac{1}{4}$x$\frac{3}{8}$-in. pea and $\frac{3}{8}$-in. resultant. The three larger sizes go into a four-compartment conveyor for distribution to the proper loading points or storage bins, with or without mixing as desired. Minus $\frac{3}{8}$ and water flow into a concrete settling tank, from which the coal is removed over a bar-screen dewatering section by a drag conveyor and deposited in the four-compartment conveyor. Clarified water is pumped to a head tank feeding the washer by a 5,000-g.p.m. Fairbanks-Morse centrifugal. "Procite" may be used both for freezeproofing in cold weather and improvement in combustion characteristics.

Washing of 5x$\frac{3}{8}$-in. also is the practice at Powhatan Point mine, Powhatan Mining Co., using Chance sand-flotation equipment. Skips at Powhatan Point dump into a 20-ton surge bin feeding the main shakers. The upper takes out 8-in. lump, which can be recombined if shipping mine-run. If not, this lump goes into a Jeffrey single-roll crusher for reduction to minus 6 to 8 in. and discharge to the lower shakers, which make three products: 5-in. lump, cleaned on a picking-table-loading boom; 5x$\frac{3}{4}$, onto the conveyor feeding the Chance cone; and minus $\frac{3}{4}$, conveyed to Heyl & Patterson "Jouncer" screens for removal of minus $\frac{3}{8}$-in. material. This minus $\frac{3}{8}$ may be loaded, sent to a storage silo or recombined with the washed coal. The $\frac{3}{4}$x$\frac{3}{8}$ goes to the cone-feed conveyor, which also receives lump pickings after reduction to minus 2-in. in a Jeffrey single-roll crusher.

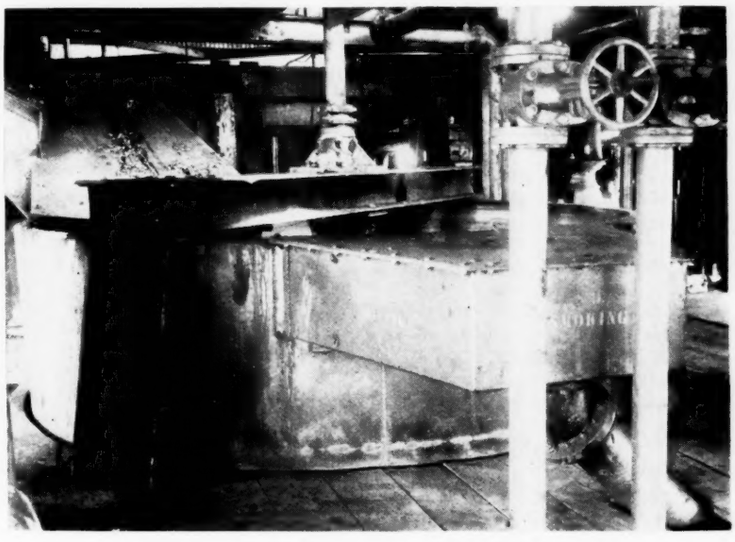
Screens Make Three Sizes

Washed coal is delivered to a pair of Parrish-type washed-coal sizing and desanding screens making 5x2-in. egg, 2x$\frac{1}{4}$-in. nut and 1$\frac{1}{4}$x$\frac{3}{8}$-in. pea or stoker. These are returned to the tipple for loading separately or in combinations with each other and with hand-picked lump and raw $\frac{3}{8}$x0 to make sizes up to and including mine-run. Lump, egg and nut are loaded over booms. "Procite" treatment is available as desired. Refuse is desanded on separate shakers (also equipped with Hendricks screens). Sand and water from both these and the washed-coal screens flow to a sump for return to the cone by Morris pumps.

Truck disposal of refuse is the practice at all stripping operations. Deep mines employ larries, larries with an aerial tram or mine-car hoist, and trucks with larries or other equipment. Two Connellsville larries are used at Rail & River No. 3; a Heyl & Patterson throwing larry at Crow Hollow No. 1; mine-made and Atlas larries at Dorothy; twin larry cars pulled by a locomotive at Blaine; and a self-propelled larry equipment at Powhatan Point. Mine No. 6, J. H. Somers Coal Co., employs a combination of trucks and end-dump mine cars. At Camel Run, mine rock is handled by a 10-ton Connellsville larry. Plant refuse is hauled away in trucks. At Dun Glen No. 11, mine rock is dumped into a 30-ton bin feeding a 20-ton Differential three-way-dumping larry. Plant refuse is trucked to a separate dump. Plant refuse at Wheeling Township No. 2 mine is conveyed to mine cars which, with rock cars, are hoisted to a hill top and dumped into a bin feeding a larry.

Willow Grove No. 10 was equipped with an American Steel & Wire Co. double reversible aerial tramway using two 108-cu.ft. buckets in September, 1937. Utilization of storage space at a greater than contemplated rate, due, among other things, to loading the drawslate with the coal, resulted in reconstruction to eliminate the two tail towers in favor of a single terminal on the hill back of the plant. A 40-ton bin was erected to receive refuse from the tramway buckets. This bin feeds a 20-ton Differential three-way larry dumping up to a mile away. Thus, the hoist to the top of the hill is handled by the tramway and actual disposal by the larry, materially extending the possible dumping space.

Willow Grove No. 10 aerial tramway terminal, showing bin and refuse larry.



Cone for 5x$\frac{3}{8}$-in. coal, Powhatan Point.

FOREMEN'S QUESTION FORUM

Receptacles in Which Shotfirers and Miners Can Carry Explosives Into Coal Mines

"STANDARD Containers for Carrying Explosives Into Mines" was the subject of a report presented at the Bluefield convention of the Mine Inspectors' Institute of America, June 2 of this year, by a subcommittee of that institute's standardization committee. This report was approved by that parent committee and by the convention assembled on the same date, subject to a ballot of members which has just been distributed. The chairman of the committee is Richard Maize, Secretary of Mines, Pennsylvania. Bakelite is a phenol-formaldehyde resin that will not support combustion but can be burned at 482 deg. F. The suggested standards are as follows:

Receptacles for Stick Explosives

Receptacles for stick explosives are divided into two classes: (1) Those used by individual miners and limited to a capacity of 5 lb., and (2) those used by shotfirers who receive their supply from a distributing point in the mine (receptacles for shotfirers may have to hold 50 or more cartridges).

Receptacles in both of these classes may be of wood, Bakelite (or materials of like nature), and pressed hard fiber. In addition to the receptacles made of the above-mentioned materials, bags of rubber, rubber composition, or rubberized canvas may be substituted.

Materials for Receptacles

Wood—(1) Good, sound cypress, basswood, or other wood of equal strength, dry, well seasoned and free from knots. (2) Minimum thickness of all lumber for finished boxes not less than $\frac{1}{2}$ in. (actual thickness). (3) Wood of which box is constructed, impregnated with paraffin or equally suitable waterproofing material. (4) No nails or any metal parts to be used in the construction of receptacles. Construction to be tongued, grooved and dovetailed. (5) Box closed by lid, preferably sliding. (6) Box provided with suitable handle, strap or carrying device of non-conducting material.

Bakelite (or material of like nature) and pressed hard fiber—to (1) withstand a static load of 1,000 lb.; (2) have smooth finish; (3) be moisture-resistant; (4) have no metal parts; (5) be provided with suitable handle, strap, or carrying device of non-conducting material; (6) have no open or exposed joints in bottom or sides; (7) have lid in one piece so constructed and fastened that it cannot open during transportation.

Bag Material

Bags shall be made from materials that will not readily break down in service and will be waterproof, acidproof and non-conducting. Metal parts shall not be exposed on inside of bags. Means for positive closing of bags and a suitable handle or strap for carrying them must also be provided.

Jute for shotfirers' bags—Jute must weigh at least 13 oz. per square yard, and be impregnated with not less than 18 oz. of rubber per square yard, and processed fabric must weigh not less than 31 oz. per square yard. *Duck for shotfirers' bags*—Duck must weigh not less than 16 oz. per square yard, and be impregnated with $8\frac{1}{2}$ oz. of rubber; the processed fabric must weigh not less than $24\frac{1}{2}$ oz. per square yard.

Jute for miners' bags—Jute must weigh not less than 13 oz. per square yard, and be impregnated with not less than 18 oz. of rubber per square yard, and processed fabric must weigh not less than 31 oz. per square yard. *Duck for miners' bags*—Duck must weigh not less than 8 oz. per square yard, and be impregnated with 8 oz. of rubber, and processed fabric must weigh not less than 16 oz. per square yard.

Other materials for shotfirers' and miners' receptacles will be considered if they meet foregoing specifications.

Detonator Receptacles

Detonator receptacles for electric detonators or electric squibs may be of leather, rubber composition, wood, Bakelite (or material of like nature), or pressed hard fiber.

Wood, Bakelite, and pressed hard fiber used in these receptacles shall comply with specifications already set forth for the same material when used for miners' or shotfirers' stick explosives receptacles, except that the wood shall be not less than $\frac{5}{16}$ in. thick. When of sole leather or rubber composition, receptacles shall be at least $\frac{3}{16}$ in. thick.

When detonators are not in individual containers the bag in which the detonators are carried should be equipped with a receptacle having individual compartments into which the detonators may be placed. These receptacles are all required by law to be provided with means whereby they can be securely locked.

Receptacles for Granular Black Blasting Powder

Receptacles for granular black blasting powder may be of Bakelite (or like material), of pliable rubber, or pressed hard fiber. Bakelite (of like material) and pliable rubber receptacles shall have a thickness of not less than $\frac{1}{4}$ in. Pressed hard-fiber receptacles shall have a thickness of not less than $\frac{3}{8}$ in. All receptacles for granular black blasting powder of the above-mentioned materials shall be dropped for test when full 10 ft. onto a hard metallic surface and shall also withstand a static load of 1,000 lb.

These receptacles shall meet also the following specifications: (1) Be no more than 9 in. in height over all and of such size as to contain not more than 5 lb. of powder. (2) Be constructed of not more than two pieces of material, which pieces shall be securely fastened together without metallic fasteners. (3) Be of a bright red color. (4) Be so formed as to permit the pouring of powder through an opening which shall be at the top of the container; such opening shall have an inside diameter not in excess of $\frac{3}{4}$ in. (5) The pouring spout, or neck, shall have a smooth interior and be provided with a stopper which shall be securely attached to the receptacle. (6) The stopper shall be so designed as to be applied externally and when put in place should not come off in case of accident or of its own accord. (7) The receptacle shall be equipped with a handle, handles, or carrying lugs which shall be so arranged on the receptacle as to lend only to the carrying of the receptacle in a nearly upright position.

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A Reader Poses a Question On Air Moved and Power Needed

Q.—A certain quantity of air is being passed through an airway 8,000 ft. long under a pressure of 4 lb. per square foot. (1) What will be the result if the same power is applied and if the airway is extended so as to be 16,000 ft. long and all the other dimensions remain the same? (2) What will be the ratio of the quantity of air passing and what will be the velocity of the air as compared with the quantity and velocity respectively before the length of the airway was doubled? (3) What will be the pressure after the extension of the airway as compared to the pressure before its extension and will the pressure be greater or less than before? (4) If the fan speed now is 64.32 revolutions per minute, will the change suggested add to or detract from the speed and what will be the speed in revolutions per minute?

A.—The problem must be attacked solely as a problem of equality of power applied,

though, as the question gives the pressure per foot, the reader may be tricked at first into calculating the velocity and quantity on the basis of an equality of pressure and not on equality of power. Power applied to the air-pressure × quantity, and quantity = velocity × cross-sectional area. A condition given in the question is that the cross-sectional area is one of the dimensions that does not change. Therefore, quantity must increase in proportion to increase in velocity. To put the preceding statement algebraically: power $= p \times q$ where p is pressure and q is quantity, and $q = v \times a$ where v is velocity and a is cross-sectional area, so power $= p \times v \times a$. Power and a are both constant, so pv must be constant. Hence, if p increases, v must decrease proportionately; otherwise the power will not be constant. It is clear then that p will change and v will be changed, so we will make the present pressure (which happens to be 4 lb. per square foot) $= p_0$ (the zero is not used as a number but as a symbol or name showing to which pressure we are referring). Similarly, the pressure after the extension of the airway may be said to be equal to p_1. The velocities will be v_0 and v_1 respectively. Then $p_0v_0 = p_1v_1$. In like manner, let the area of the surface of the short roadway equal s_0 and the area of the surface of the long roadway may be equal to s_1.

Use Atkinson's Rule

Atkinson's rule regarding velocity is that $p = ksv^2 \div a$ where p is the pressure, k is a certain coefficient, or multiplier, depending for its value on the roughness of the sides of the airway, the kind of timbering and so forth, s is the perimeter of the airway multiplied by its length, v the velocity of the air, and a the cross-sectional area of the airway.

The coefficient k is constant because the second half of the roadway is the counterpart of the first half and a is a constant because the dimensions other than the length do not change. As $p = ksv^2 \div a$ we can substitute $ksv^2 \div a$ for p in the expression for power $p \times v$, then $(ksv^2 \div a)v$ will equal $p \times v$. Now, $(ksv^2 \div a)v = ksv^3 \div a$. Therefore, $p_0 \times v_0$ will equal $ks_0v_0^3 \div a$, and p_1v_1 will equal $ks_1v_1^3 \div a$. Things that are equal to equal things are equal to one another. As $p_0 \times v_0 = p_1 \times v_1$, therefore $(ks_0v_0^3 \div a) = (ks_1v_1^3 \div a)$. If both of these equal things are divided by k and multiplied by a they will be equal, so $ks_0v_0^3 \div a \times a \div k$ will equal $s_0v_0^3$ and similarly $ks_1v_1^3 \div a$ will become $s_1v_1^3$. Therefore, $s_0v_0 = s_1v_1^2$. But s_1 is the perimeter of the airway multiplied by its length, and the length is doubled while the perimeter remains the same. So s_1 must be twice s_0 or equal to $2s_0$.

Twenty-One Per Cent Less Air

Hence, $s_0v_0^3 = 2s_0v_1^3$. Dividing both sides by s_0, we have $v_0^3 = 2v_1^3$ or, turning the equation around, $2v_1^3 = v_0^3$. Dividing both sides of the equation by v_0^3, we have $2v_1^3 \div v_0^3 = 1$ and dividing both sides by two, $v_1^3 \div v_0^3 = 1 \div 2$. Taking the cube root of both sides, $v_1 \div v_0 = \sqrt[3]{1} \div \sqrt[3]{2}$. The cube root of 1 is 1 and the cube root of 2 is 1.2599. Hence $v_1 \div v_0 = 0.79371$. That is, the quantity and velocity of air delivered, when the power on the air remains constant and the length of the roadway is doubled, is about three-fourths as much as before.

As $p_1v_1 = p_0v_0$, therefore $p_1v_1 \div p_0 = v_0$, and $p_1 \div p_0 = v_0 \div v_1$. But it has been shown that $v_1 \div v_0 = 1 \div 1.2599$, so $v_0 \div v_1 = 1.2599$. Hence $p_1 \div p_0 = 1.2599$. This result can be seen to be just what is to be expected, for, as the power is constant and equals pv, when v decreases p must increase in like measure or the product would not be constant.

Thus the new pressure (p_1) will be 1.2599 times the old pressure (p_0) and thus greater than before, whereas the new velocity (v_1) and quality (q_1) were found to be smaller than before. The old pressure (p_0) was 4 lb. per square foot, and the new pressure will be $4 \times 1.2599 = 5.0196$ lb. The fan speed will have to be proportional to the quantity or velocity of the air. Whereas it was 64.32 r.p.m., it now becomes $64.32 \times 0.79371 =$ about 51.05 r.p.m.

However, the equation $p = ksv^2 \div a$ is not absolutely correct though generally accepted. Moreover, as pressure increases, if the airway loops on itself, leakage increases. The rule of thumb is that power varies as the cube of the quantity or as the cube of the velocity if the cross-sectional area is constant, and both quantity and velocity vary as the cube root of the power under such circumstances.

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How Intake Air Is Filled With Methane By Falls of Barometer or of Rock

MANY an intake is safe from contamination only when there is a high barometer which will drive back the methane that has collected in standing rooms. With a low barometer (which is the condition half of the time) the atmosphere in the rooms will be relieved of pressure and will expand and part of it will get into the heading, so that, even if the air in that heading does not become explosive, it will be well on its way to that condition by the time it reaches the working places. If the barometer falls an inch, about one-thirtieth of all the stagnant atmosphere in the standing rooms will enter the heading and contaminate the air so that it will no longer be fresh.

A nice and easy calculation would be: Given the volume of the uncaved space in cubic feet adjacent to an intake and given a fall of the barometer of an inch in 5 hours, what percentage of methane would be found in the air passing the area when the volume of the current per minute is a given number of cubic feet. and if the air in the standing space contains 50 per cent of methane? The answer might make the figurer sit up and take notice. Practical demonstrations of the ever-present danger have made many mine managers sit up nights, draw pillars, barricade room mouths, or bring the air into the mine by another route.

Thirteen-Inch Water Gage

It is well to remember that air is not easily shut off when a heavy fall of barometer occurs. Stoppings will leak when the water-gage pressure is only 1 in.. and an inch of mercury is equal to 13.608 in. of water gage. That is a figure worth remembering—1.134 ft. of water, half a pound per square inch or 71½ lb. per square foot. Fortunately, the surface atmosphere usually takes some hours to drop the equivalent of an inch, so the difference of pressure behind the stopping and in front of it is never equal to a whole inch of mercury, but the uncomfortable reflection is that the tighter the stopping the more nearly will the difference of pressure on its two sides equal that inch of mercury because if the air cannot leave the closed area the pressure will be measurable by the entire fall of the barometer.

There is a nemesis—a cruel and pursuing fate—in a gassy mine with acres of standing pillars with or without tight room stoppings. No one can feel safe in any part of such workings. All the stoppings can do is to make the methane-filled air escape slowly, so as to give the air time to sweep it away without being too heavily charged with it at any one time or so as to await the period when a high barometer once more will drive the methane back into the recesses of the mine.

Rock Falls Worse Than Mercury

But bad as a fall of barometer is, a large fall of roof in the standing area is far worse. This drives out the methane in a few seconds, almost instantaneously. The air in the heading cannot carry it away. Here, the volume of the air displaced by the fall may have to be compared not with the huge volmues of air traveling for minutes or hours past the mouth of the room which has the fall but with the far smaller quantity of air in the heading at the mouth of the room when the fall occurs, for that air will not travel on at all into the mine but will be pushed back temporarily by the burst of methanous air from the room mouth which will throw a dam of such air across the pathway of the regular current. Thus an intake almost entirely free from methane may became changed suddenly into an explosive mixture.

It is for this reason that it is dangerous, in a mine generating methane, to take the trolley wire or any sparking mechanism past rooms likely to cave. This is what happened in the Sonman E slope mine. A live trolley wire was installed in front of and beyond a room in which a pillar then or later was being drawn. The locomotive using that trolley for power was not a menace until the roof fell. Then suddenly the room caved; gas from the roof rushed out, and the locomotive at once became a most dangerous piece of equipment. It is a change of condition like this that management should foresee but too often does not. Remember, it is the mistakes that kill and maim. To be 90 per cent safe is to be 10 per cent suicidal! One's management is judged not by the ninety and nine safety measures put into practice but on the one which, being overlooked, precipitated the disaster.

QUESTIONS ASKED BY STATE BOARDS

Questions and Answers, Examination for Anthracite Foremen and Assistants

Q.—What are the provisions of the mine law pertaining to second openings?

A.—No person may be lawfully employed by owner, operator or superintendent in a mine or be in a mine for the purpose of working therein unless there is, in every seam or stratum of coal and from every lift thereof worked in such mine, not less than two openings or outlets, separated by a stratum of not less than 60 ft. in breadth underground and 150 ft. in breadth at the surface, at which openings or outlets safe and distinct means of ingress and egress must be at all times available.

However, these need not necessarily belong to the same mine, and the requirement does not apply to work in opening a new mine or a new lift while being worked to connect the said outlets, so long as not more than 20 persons are employed at any one time in such mine or lift. Moreover, it shall not apply to any mine or part of a mine in which the second outlet has been rendered unavailable by reason of final robbing of pillars, so long as not more than 20 persons are employed therein at any one time. The cage or cages and other means of egress shall at all times be available for the persons employed where there is no other outlet.—Sec. 1, Art. IV.

Q.—Does a high water gage always indicate that a large quantity of air is in circulation in a mine? What does a low water gage indicate?

A.—A high water gage does not indicate necessarily a large quantity of air, but, on the contrary, often a small quantity of air, despite the fact that new fans rightly are bought and high fan pressures justifiably are sought to get higher water gages and more air into a mine. If there is a bad fall in an airway, if the airways are too long, if regulators have to be partly closed to make the air travel through a long, highly resistant split or if the mine workings become extended, the water gage may be raised and the delivery of air, nevertheless, may go down.

The high water gage also may be due to the tightness of the stoppings, which make all the air go to the working face and not "sneak back," leaving undone its work of purifying the mine. A large quantity of air under low water gage shows that the mine is small, headings short or both, that the airways are of ample sectional area for the volumes of air to be delivered and distributed and also are smooth and free from falls, that the air is properly split or that the air travel has been arranged so as to be greatly shortened.

Don't rest the health and safety of the men in the mine on the reading of the water gage, but solely on the quantity of air delivered where there are men to breathe it and ignite its methane and where there are gases and fumes to be removed. However, raising the water gage will increase the quantity of air, if the mine conditions otherwise are unchanged or are bettered. Don't blame the fan if a high water gage produces only a small volume of air. Blame yourself or the large extent of the mine.

Queries Asked First and Second Class Foremen At Examination Held in State of Ohio*

Q.—If you discovered smoke in the return air current of a mine of which you were in charge, state how you would proceed to handle the situation, giving each procedure in the order of its importance.

A.—General Considerations.—Before the fire occurs I would have plans formed for coping with it. The best time to fight a fire is before it starts. I would try to get every man in my mine provided with a self-rescuer, and see that he knows how to use it and that he keeps it in condition and ready for instantaneous use. In my rounds, I would emphasize this matter and tell the sub-foremen to do so also.

Provided the smoke, to which reference is made in the question, does not arise from the firing of shots—and the odor and character of the smoke would testify to this—I would first keep control of myself and, secondly, temporarily, but immediately, suspend operations at the mine and send men through the headings (1) to order all men out (except those who are to fight the fire) and (2) to instruct them as to the safest way to leave the mine and (3) as to what provisions, if any, have been made for their transportation. I would tell the men (4) to remember to bring their self-rescurers with them. I would call the attention of the admonishers to the fact that they have four orders to transmit, and must overlook none of them.

To summon the men who are to notify the others and to give others orders, I would use the telephone wherever available. The mining law of 1941 requires, Sec. 87, that a telephone connection be provided between each main switch of the mine and the outside. The deputy mine inspector may designate other inside points that must be provided with telephones.

I would appoint one man to keep track of the number of men in the mine and their arrival at the surface. He should learn as much as possible from the men escaping from the mine as to conditions underground, so that the man in charge can direct his operations accordingly. If there are openings away from the main portal, men should be stationed at these. Their duties should be to obtain information about underground conditions and to give help to those needing such assistance. One or more men should patrol from opening to opening and telephone or carry back to the tipple such information as is available. Apparatus men, if available, can enter the mines with breathing apparatus to bring out men that are overcome, to provide short circuits for the air or to block the air off the fire if such action be desirable and possible.

Beware Fall of Trolley Wire

If it appeared likely that the fire would dislodge a trolley wire and cause a short circuit, I would disconnect the power from that section of the mine, and I would cut off the current from the mine whenever it was not to be used for transportation of men or material. Moreover, the fire may have an electrical origin and, if there is any doubt as to the cause, I would order the current switched off. I would send to the fan some reliable person who would follow orders closely, with instructions to keep unauthorized persons from reversing the air current. The law of 1941, Sec. 57, requires that "No fan shall be reversed while men are in the mine unless authority to do so is given, preferably in writing, by the mine foreman, superintendent, State inspector, or other responsible person." Who the responsible person is at any given time should be definitely understood. It may change with the arrival of new persons on the scene and change with the departure of men into the mine, but there should be no divided authority, but one man, and one only, should have definite responsibility at any given time.

If certain parts of the mine are definitely planned as safety chambers, it will be desirable that no air current reach such areas, and, to this end, the air should be short-circuited immediately out by such safety chambers, as at *A* in accompanying sketch, Fig. 1. Even if the men are expecting to leave the mine, this should be done, for they may get into polluted air and decide to return, and the safety chamber will then not be polluted with mine-fire gases, though there may be methane and carbon dioxide present and the oxygen content may be somewhat low. These pollutions, however, will be less distressing than they would have been if the barricade had been immediately established

* Continued from page 63, *Coal Age*, September, 1941.

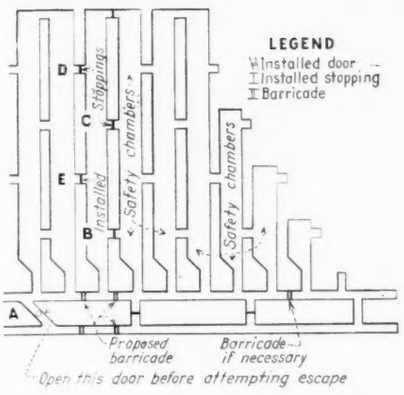


Fig. 1—Before attempting escape immediately after a mine fire, door at *A* should be opened to cut off circulation of poisonous gases in safety chambers and room heading. Barricades *B* and *C* might be erected prior to the start of the mine fire, but other barricades will not be built until the men decide to immure themselves.

and the men had not endeavored to escape. The men, acting as fire wardens, should be told to open the doors so as to provide such short circuits.

These fire wardens should be told to tell others that hot, smoky air is sure to be polluted with poisonous gas, and no chances should be taken unless a self-rescuer is in use, for many men entering safety chambers have their blood tainted dangerously already with carboxyhemoglobin from the gases they have breathed in early endeavors to escape.

What action should be taken depends largely on the ventilating system of the mine, especially on the direction of travel of air in the haulageways, and also on the location of the fire, whether on intake or return or in workings which in a sense are in between. The examination question merely says that smoke is discovered in the return but not that it emanates from that part of the ventilating system. Let the several conditions be taken and illustrated one at a time.

Fire Meets Air on Way Out

(1) *Fire and haulways both on return;* see Fig. 2. Air returns through main haulways, as is the usual practice in Ohio, so that condition will be considered first. In this case, the fire will not vitiate any air in the working places but will make it impossible to travel a portion of the haulway—that toward the mine opening here shown as a shaft. The men may be instructed to proceed through the haulway by the return almost to the fire and then go to the intake at *B* through a crosscut *A* provided with a door inby the fire, but if the intake makes the better travelingway they may be told to travel the intake all the way.

Of course, this crosscut with door shown so convenient to the fire may not be so close to it as is depicted in the sketch. It might be 1,000 or more feet away, but, if a fire were to be anticipated at the point indicated, a door in the next crosscut would be a distinct asset.

Sometimes the intake is low, irregular and cluttered with rock, in which case the traveling may be difficult, and in some cases it may be possible to use a locomotive already inby the fire to bring the men to the crosscut leading to the intake. It may be quite necessary to tell the men to travel as last suggested or travel the intake airway the entire way, for men who have been in the habit of entering by the haulageway, which is the return, will be likely to try to use that way all the way out in preference to any other and fall victims to carbon-monoxide poisoning.

With Fire, Air Still Travels

However, with a mine fire men usually realize where danger lies, whereas, with an explosion, the air does not travel after the explosion has occurred and the chances of walking into afterdamp accordingly are greater. There may be another return that is not vitiated (another parallel entry, for instance) and the men may be told to leave by that or by some little-used intake which an opening to the surface may provide.

(2) *Fire on Intake and Haulway on Return;* see Fig. 3. This is always an almost hopeless condition unless the fire is quite mild, and the best solution is to reverse the fan, in which case the men can enter the intake airway, now the return (Fig. 4), and travel to *A* and then pass through the trap door to the intake at *C*, which was the return, and so get out of the mine. But reversal in a mine with methane is dangerous, especially if there is much of the gas, for the methane percentage is kept within safe limits only by diluting it with a steady stream of air, often none too large for entire safety; but when the fan is slowed to a stop and the reversal of the fan is made by reversing the positions of fan doors (which is necessary with older fan types) and then the fan is speeded again, the methane will collect in the mine during the stoppage, so that when the air reverses it will carry an explosive percentage to the fire. Again, the men may not know the fan is reversed and if escaping in a safe direction, may be put in jeopardy by the reversal. Still, if the fire is active it is difficult to see how reversal can make matters worse for the men, except that to the reversal will be charged the almost inevitable toll of human lives. If the men have self-rescuers, and would use them, fan reversal would be unnecessary. That is why self-rescuers are so essential in a mine generating methane.

(3) *Fire and Haulways Both in Intake;* see Fig. 5. In this case, there is no way for the men to get out except through the fumes, perhaps with the help of self-rescuers or by the reversal of the fan and the use of the crosscut, *A*.

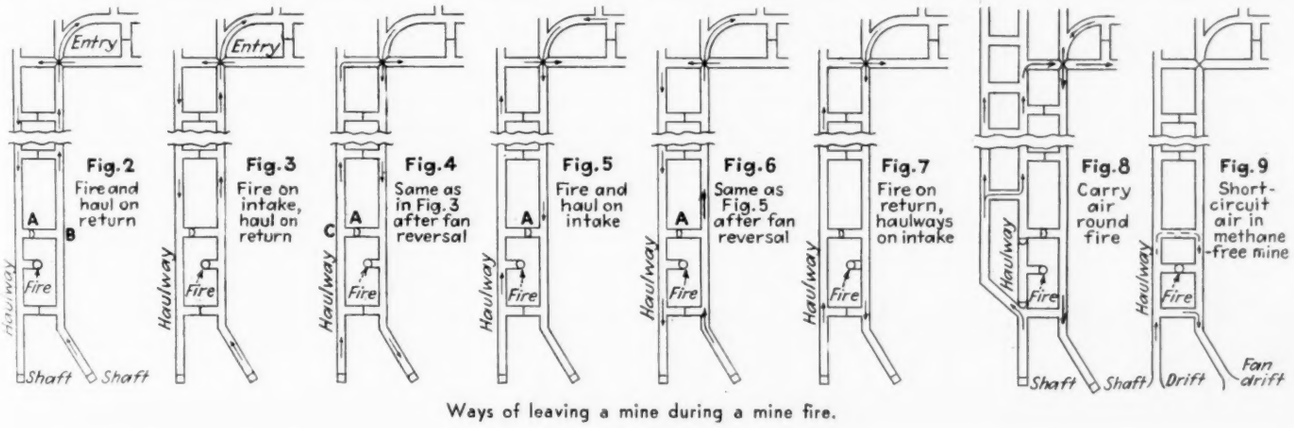
(4) *Fire on Return and Haulways on Intake;* see Fig. 7. With this condition the haulways can be used in their entirely for the rescue of the men. In fighting the fire also the most favorable condition will exist. No need will be found for fan reversal with its dangers or for self-rescuers. The fire can be fought barefaced.

In a mine that generates no methane, the air might be short-circuited in front of the fire if a crosscut is available. This would increase the air traveling and would help the men at work in the extinguishment of the fire. If the fire is between crosscuts, it may be necessary to take the air through to the next crosscut, *A*, opening the door despite the fact that the air will aid combustion, but the work of the firemen in extinguishing the blaze should be more effective than the action of the oxygen on the coal. Too little air will hamper barefaced fire fighters more than it will hinder the progress of the fire.

Where the fire starts, as it usually does, in the live workings—at a point, that is, where it would be difficult to say whether the air is intake or return—the problem is quite difficult but not different in character.

Where Methane Is Generated

In a mine generating methane, the short-circuiting of the air at or near the fire would be dangerous, but in most such mines there is more than one intake and more than one return and the air can be passed along these channels. Where a fire is feared and a second heading is available, as in Fig. 8, it might be well to have doors inby and outby on the main haulway so that at the commencement of a conflagration all air might be shut off the fire. An advantage in using the haulway as an intake is that where any place likely to catch fire such as a substation goes from intake to return, the fire goes to the airway (Fig. 9), instead of going to the haulway.



Ways of leaving a mine during a mine fire.

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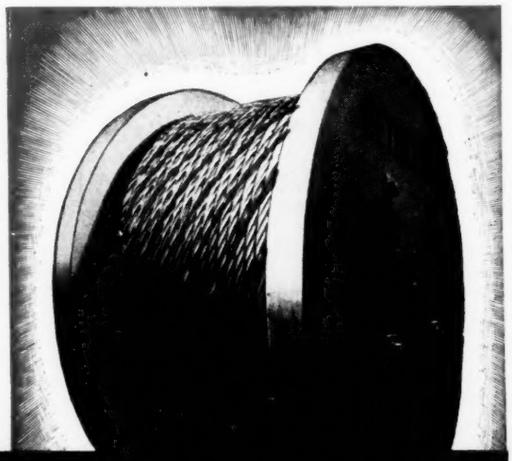

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WHAT'S NEW IN OPERATING IDEAS

Bone on Top of Coal Seam Removed by Scarifier

A scarifier made of mining-machine bit blocks is used to remove bone on top of the seam prior to loading the coal at the stripping operation of the Dye Coal Co., in eastern Ohio. As shown in the accompanying illustrations, the bit blocks are mounted on parallel rods carried in brackets on the Baker bulldozer used with an Allis-Chalmers Model WM gas tractor in rough cleaning. The blocks are held in position at the proper intervals by pipe spacers. Regular cutting-machine bits are used.

As the tractor moves forward in bulldozing, the scarifier rotates so that the bit blocks are vertical. Thus, the bits are inoperative. As the tractor backs up, however, the scarifier rotates back into working position and, held down by the weight of the bulldozer, rips off the bone. On the next forward trip, the bone is pushed off the coal by the blade. Final touches are put on the cleaning job by a Hough power-driven broom on an Allis-Chalmers Model W gas tractor.

Scarifier in working position as tractor moves backward.

On the forward, or bulldozing, move, the scarifier rotates up into inoperative position.

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Control Board Installed With More Room in Back

Reversing the usual order, electricians inspecting and maintaining equipment in the Dorothy mine, Youghiogheny & Ohio Coal Co., Glen Robbins, Ohio, have more room back of the control board in a newly built substation than those having occasion to manipulate switches and adjust rheostats on the front. Furthermore, the board is mounted sidewise in its ell compartment of the substation room, thus providing direct access to the equipment in the rear.

This underground station, consisting of a 300-kw. 275-volt Westinghouse motor-generator with I.T.E. 1,600-amp. Type KSA automatic breaker on the d.c. feed, is 7,000 ft. from the drift portal. Recently installed, it supplies good power to the shaker conveyors, mother belts and auxiliary equipment.

Substation walls are concrete blocks, with brick columns at the opening to the ell supporting a 12-in. H-beam. The roof was made by putting up steel rails, placing corrugated lagging over the top of them and then packing in 8 in. of concrete to make an airtight seal against the rock. A gravity closing door is the finishing fireproofing touch. Thermostats are to be installed on the motor-generator bearings to trip the door if overheating occurs.

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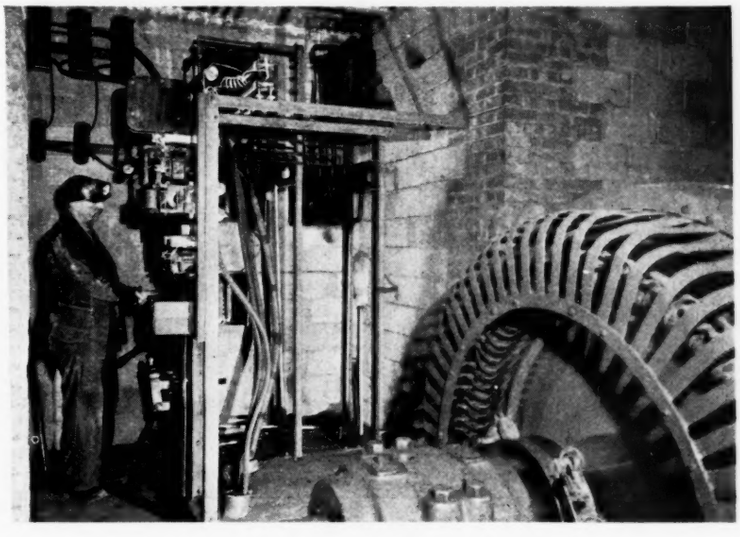
Cables Purchased in Sections With Terminals Soldered On

The 1,000,000-cir.mil positive and negative cables forming the 275-volt power line serving shaker-conveyor sections in Rail & River No. 3 mine, Rail & River Coal Co., Dilles, Ohio, were purchased in 160-ft. sections with the terminals soldered on at the factory. The shakers in Rail & River No. 3 are served by belt conveyors extensible to 960 ft., which transport the coal from the rooms to mine cars at the mouth of the room entry. Pieces of hose a few feet long placed over the cables next to the terminals serve as guards and reduce the tendency of the terminals to catch when the cables are dragged on the bottom in moving. The terminals are of the flat type, with holes to accommodate two bolts.

When mining on a room entry is completed and the belt and equipment are moved out, it has been found advantageous to place the cable sections on the belt in stretched-out condition and then operate the belt to carry them to cars, on which they are coiled as they arrive. Twelve 160-ft. sections make up the positive and negative conductor requirements



Plenty of room to operate the board but twice as much to get at the equipment in the back.

Cable section with hose guard next to terminals.

for a single room unit (belt and seven or eight shakers with duckbills). Experience has indicated that two changes will be made in the specifications in future cable purchases. The negative, instead of being bare, would be bought with a weatherproof covering to protect the stranding, and the cables would be cut into 80- instead of 160-ft. sections to simplify handling.

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Scalping Section on Shakers Facilitates Rock Removal

The characteristic 12 in. or so of drawslate over the No. 8 seam is shot and loaded with the coal at the Willow Grove No. 10 mine of the Hanna Coal Co., Neffs, Ohio. To eliminate the resultant large pieces of rock as soon as possible in the preparation plant, a scalping section has been added to the mine-run shakers, as shown in the accompanying illustration. Raw coal from the dump hopper is fed onto this scalping section, which takes out the big chunks of coal and rock, while the finer material drops through onto the regular shaker sections.

Big coal and rock, as the illustration shows, are chuted to a platform at one side of the shaker. Here, a man slides the rock on over to a chute to the main refuse conveyor, at the same time pulling chunks of coal toward him so that they fall into the short chute leading back to the screen. Thus, big rock is removed as soon as the raw coal enters the plant, and the rest of the equipment relieved of the necessity for handling it.

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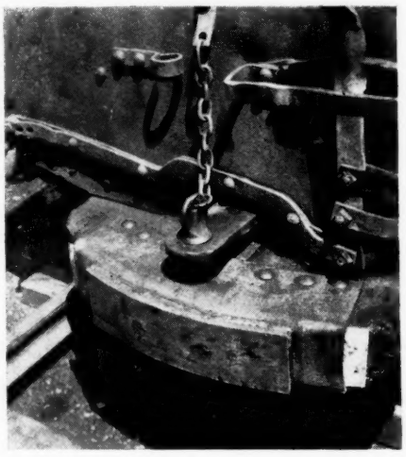
Bumper Plates Reinforced By Faceplates

To enable the bumpers on the 3-ton wood-bottomed cars used at No. 2 mine, Wheeling Township Coal Mining Co., Adena, Ohio, to stand the gaff of three-shift mechanical mining, they are being reinforced with ¾-in. faceplates welded onto the bumper faces. How a faceplate is applied is shown in the accompanying illustration. In this case, a 1-in. shim has been used between the bumper face and the bottom members. The car had just left the repair shop, and the shim was installed because the bumper was intended for a different type of car but was pressed into service because of a shortage of material.



Reinforcing plate ¾ in. thick welded to the ⅜-in. bumper.

The scalping section, mounted above the regular screen, appears at the upper left. Rock and coal go to the separating platform at the right, the coal returning to the screen through the short chute.

•

Rubber-Belting Cushion Protects Cable

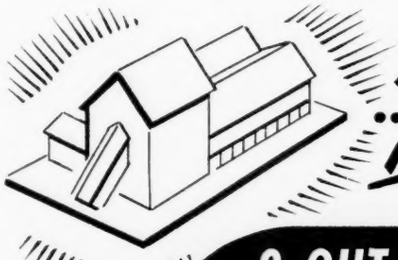
Expansion and contraction as a result of heating and cooling cause many electrical failures. Insulation is cut, worn or pulverized, causing grounds or short circuits. The accompanying illustration, made at the bottom of a 420-ft. borehole at Rail & River No. 3 mine, Rail & River Coal Co., Dilles, Ohio, shows how, in one case, damage to the sheath of a 4,000-volt cable due to movement caused by temperature changes was prevented by a cushion of rubber belting. The dark area on the belting just below the lower end of the casing shows ⅜ in. of movement, and at this point the belting has been materially reduced in thickness in the year the cable has been in service.

The cable drops 455 ft. from a factory-attached pothead and conductor suspension at the top to a line switch for an underground

Milestone

With this issue, the 21st Annual Model Mining Number, Coal Age presents another of the comprehensive studies of progressive coal-mining companies and districts which it started in 1921. The operating ideas this month, therefore, are derived from the mechanical deep and strip mines in the Pittsburgh No. 8 field of eastern Ohio, the subject of this issue. Next month, however, we return to the presentation of ideas originated by operating, electrical, mechanical and safety men in all coal-mining districts. If you have a cost-cutting or safety kink, here is the place for it. Include a sketch or photo if it will help to make it clearer. For each acceptable idea, Coal Age will pay $5 or more on publication.

EASTERN OHIO "MODEL-MINE" OPERATIONS IN PITTSBURGH No. 8 SEAM



..Prefer MORROW

TIPPLE AND SCREENING EQUIPMENT

9 OUT OF 15 COMPANIES CHOSE MORROW
10 OUT OF 20 MINES DEPEND ON MORROW

BY ACTUAL SURVEY *

COMPANY	MINE
Hanna Coal Co.	Willow Grove No. 10
Hanna Coal Co.	Dun Glen No. 11
Hanna Coal Co.	Piney Fork No. 1
Hanna Coal Co.	Georgetown No. 12 Strip
Hanna Coal Co.	Piney Fork No. 4 Strip
Rail & River Coal Co.	Rail & River No. 3
United States Coal Co.	Crow Hollow No. 1
Warner Collieries Co.	Camel Run
Florence Coal Co.	Witch Hazel
Lorain Coal & Dock Co.	Blaine
Wheeling Township Coal Mining Co.	Somers
Youghiogheny & Ohio Coal Co.	Dorothy
J. H. Somers Coal Co.	Mine No. 6
Powhatan Mining Co.	Powhatan Point
Jefferson Co.	Betsey-Strip
Rail & Lake Coal Co.	Dale-Strip
Rail & Lake Coal Co.	Brilliant-Strip
Industrial Coal & Iron Co.	Apex-Strip
R. L. Griggs	Parlett-Strip
Dye Coal Co.	Dyco-Strip

* From the *Coal Age Survey* of 15 companies and 20 mines operating in Eastern Ohio, Pittsburgh No. 8 Seam.

FAST SERVICE STILL AVAILABLE ON MORROW STANDARDIZED EQUIPMENT AND COMPLETE PLANTS

We can still give you unusually fast service on Morrow Standardized Tipple and Screening Equipment and complete Preparation Plants because standardized design enables us to skirt our overloaded engineering department. Morrow standardized equipment is the result of years of careful designing and experience in meeting the needs of coal producers, and each product has time-proved its economy, sturdiness and performance.

The scope of Morrow standardized coal preparation equipment is so broad that we can fill most of your requirements with exceptional promptness, even under today's conditions.

Nine out of fifteen large Eastern Ohio operators and ten out of twenty mines prove Morrow's acceptance. Why not let us quote you on the Morrow Equipment you need right now?

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DESIGNERS AND BUILDERS OF COAL HANDLING EQUIPMENT FOR OVER 25 YEARS

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Revolving Screens
Perforated Metal Screens
Flanged Lip Screen Plates

AN OPEN LETTER

To ROEBLING *Customers and Prospects*

Regarding Shipments . . .

In common with practically all manufacturers whose products are vital to Defense, Roebling is faced with a situation without precedent.

Despite our best efforts—the expansion of our working force—the installation of new machinery—and operation on a 24-hour basis—we find it impossible to keep up with the demand for Roebling electrical wires and cables.

We want you to know, however, that we keenly appreciate your problem. As a buyer, ourselves, we know how serious and irritating shipping delays can be at a time such as this.

Unfortunately, the pressure is increasing instead of decreasing. But we are alert to every opportunity to effect improvements. And you can rest assured that no stone will be left unturned by Roebling in its efforts to meet your needs.

JOHN A. ROEBLING'S SONS COMPANY
TRENTON, NEW JERSEY

ROEBLING 1841 1941 100th ANNIVERSARY

ROEBLING
ELECTRICAL
WIRES AND CABLES

Showing expansion wear on cable cushion at bottom of borehole.

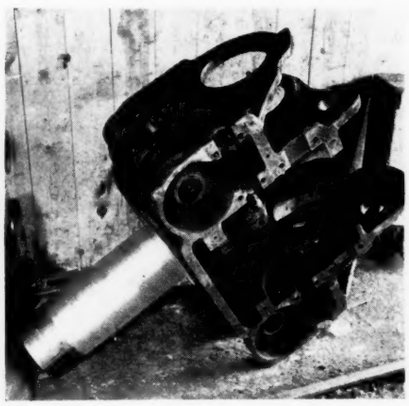
substation 50 ft. from the bottom of the borehole. Specifications for the cable (Anaconda) are: three conductors—No. 2/0 A.w.g. 19-strand MDH copper; 10/64-in. 30-per-cent rubber-covered RTF on single jute fillers; RTF "Duracord" loom weave; 2.11 in. outside diameter; shielded; suspension unit included. It feeds a two-unit 275-volt 600-kw. Westinghouse motor-generator substation operating in parallel with a 300-kw. General Electric Ignitron rectifier at the slope portal 4 miles distant.

•

Machining Precedes Welding At Piney Fork Shop

Before the large hollow stem on the neck casting for an Oldroyd cutter is built up by arc-welding in the Piney Fork (Ohio) shop of the Hanna Coal Co. some of the stock is machined away. It is true that this metal must be replaced in welding, but certain advantages outweigh that objection.

When the neck comes in for repair, the stem, besides being worn, often is out of round or alignment as a result of wracking in service. The roughly machined surface, cut to proper alignment, acts as a guide and insures a uniform thickness of weld sufficient



Stem roughly machined to proper alignment ready for building up by arc-welding.

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THE CORRECT LUBRICANT FOR ALL INTERNAL COMBUSTION ENGINES

1. Has powerful detergent properties.
2. Prevents ring sticking, piston and cylinder distortion.
3. Keeps oil passages, oil ring slots and screens clean.
4. Has high load-carrying ability.
5. Reduces engine wear.
6. Reduces danger of scratching or scoring cylinders and bearings.
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BEST IN THE LONG RUN

A Complete Line of Lubricants for all Coal Mining Equipment

Let a Marathon Lubrication Engineer help with your Lubrication Problems. He will prescribe the correct lubricant and may have other money-saving suggestions. JUST CALL OR WRITE.

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Stearns

MAGNETIC AUTOMATIC SPOUT TYPE SEPARATOR

If you have a "dirty coal" problem as the result of tramp iron and junk, it will pay you to investigate the STEARNS spout magnet shown above.

Built for rugged service, gives positive, automatic protection. In all sizes. Write for our Bulletin 97-A.

Also widely used are STEARNS improved air-cooled powerful Magnetic Pulleys (our Bulletin 302) and Suspended Magnets (Bulletins 25-A). Tell us about your capacities, plant layouts, etc.

STEARNS MAGNETIC MANUFACTURING CO.

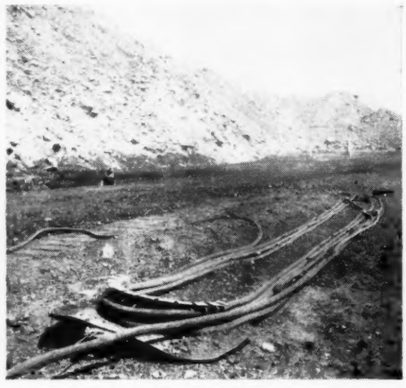
661 S. 28th St., Milwaukee, Wis.

for the final machining job. On earlier jobs of this type, when preliminary machining was omitted, final turning frequently revealed low spots, thus requiring interruption of the machining to do a second welding job.

•

Handling Shovel Cables Eased by Skid

The sheet-metal skid shown in the accompanying illustration facilitates handling the 4,000-volt trailing cables on stripping and loading shovels at the Apex mine of the Industrial Coal & Iron Co., in eastern Ohio. The skid is pulled along by a wire cable attached to the shovel, and is curved up in front so it will ride over loose stuff or uneven



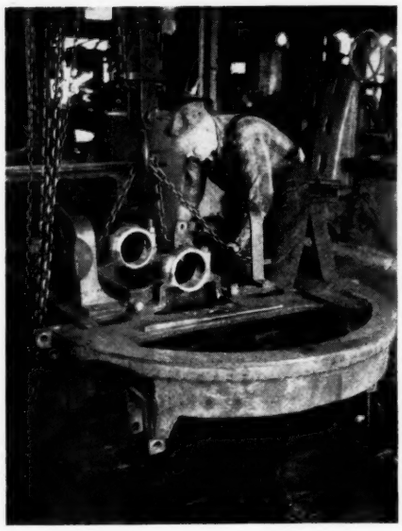
Showing use of skid on strip-shovel trailing cable.

places. The extra cable is looped around a semicircle of metal at the rear of the skid, and thus is kept close to the shovel and out of the way of other equipment with a minimum of handling.

•

Welding Results Bettered By Proper Peening

Peening of welds made by the arc process where maximum strength or resistance to impact is required now is a standard practice



Reconditioning the main frame of a loader in Piney Fork shop.

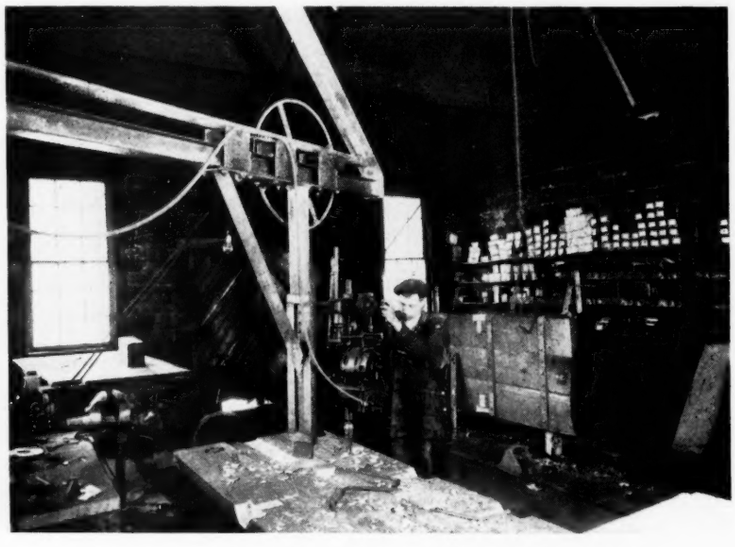
at the central shop of the Hanna Coal Co., Piney Fork, Ohio. An example is in building up the circle rail on a Whaley No. 3 "Automat" loading machine. Each layer of weld is thoroughly peened. Thus, the surface presented after final machining is dense and tough.

•

Special Drill Mount Eases Boring of Car Bottoms

Bolt holes in planks for new car bottoms at Dorothy mine, Youghiogheny & Ohio Coal Co., Glen Robbins, Ohio, are drilled straight and quickly without heavy work on the part of the repairman, using a special machine built by fitting a blacksmith's post drill with an individual motor drive and mounting the unit so that it is in effect a radial drill.

The drill proper is mounted on a carriage, or trolley, riding on a jib boom pivoted from a pilaster in the shop wall. A large handwheel with pinion engaging a rack just above the I-beam serves to move the drill along the boom to the exact position. Several bolt holes in the drop leg of the carriage permit ad-



Shop-made radial machine efficiently drills car-bottom planks.

HERE'S ONE PRODUCTION WORRY YOU CAN FORGET...

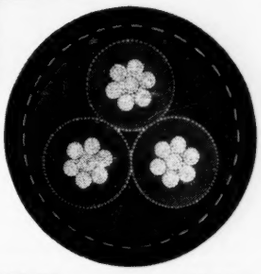
ELECTRIC CABLE OPERATION ON YOUR SHOVEL OR DRAGLINE

Neither sun... nor rain... nor cold... sharp rocks or heavy blows can cause serious injury to HAZACORD SHOVEL CABLES

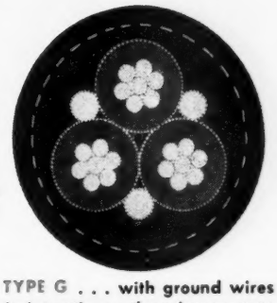
Its two-ton tensile strength rubber jacket—mold cured for greatest toughness and resistance to tear or injury—makes HAZACORD Cable your choice if you want to assure uninterrupted power transmission to your shovel or dragline.

Hundreds of installations of this better electric cable prove its unusual ability to defy all kinds of punishing use and extremes of weather—yes, and even heavy trucks or other equipment frequently running over the cable cause no perceptible damage. HAZACORD is built to take it.

This is why we say, after you install HAZACORD Shovel Cable, forget it!



TYPE W . . . without shielding or ground wires. Tough, long-aging, moisture-resisting rubber insulation on each conductor. Conductors are cabled together with rubber fillers, covered with a belt of highest grade tough rubber compound, reinforced with embedded seine twine cord. For use up to 2500 volts.



TYPE G . . . with ground wires in interstices, otherwise same as TYPE W. For use up to 5000 volts, but for best results and utmost safety we recommend shielded cable for over 2500 volts.

TYPE SH . . . shielded, (not shown) is offered in many different styles to meet your particular requirements.

To assure you the greatest efficiency and economy with your shovel cables, HAZARD provides, without charge or obligation, an experienced engineering service to help you select the right cable for your own needs. Just write or call.

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HAZARD Mining Cables

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Simplicity GYRATING COAL Screens

. . . SMOOTH, "BUILT-IN" POSITIVE ACTION DECREASES WEAR, INCREASES EFFICIENCY!

Being the first to utilize counterbalanced eccentric shafts on mechanical vibrating screens, SIMPLICITY Gyrating Coal Screens today reflect this pioneering experience in a perfectly balanced unit that has the weight of the entire screen deck exactly distributed over the entire assembly. This attention to balance gives SIMPLICITY users positive "built in" action, greater active screen service life and maintenance free operation. When considered in terms of each screen's production, these benefits indicate why SIMPLICITY users achieve such outstanding results as five, *eight* or even *ten* seasons of service without overhauling . . . *records that you can duplicate.* Investigate SIMPLICITY Screens . . . call in a SIMPLICITY engineer, and let him recommend the proper screen for your operations. Screens in single, double and triple deck types, 2'x3' to 5-x24'.

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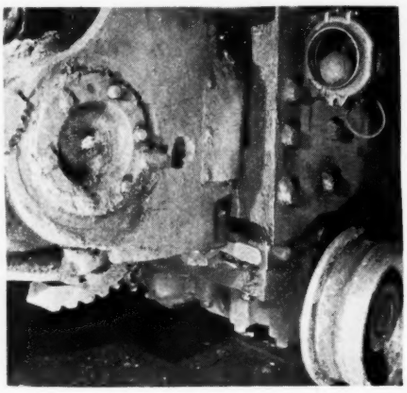
justing the height of the drill for various types of work. Before drilling, the planks are clamped together in correct relation and the hole positions spotted with a template.

•

Ten-Hour Job Cut to Two By Hole in Casting

A ten-hour job for two men was cut to two simply by cutting a hole in each side of the neck casting of the Oldroyd track-mounted cutting machines at mines of the Hanna Coal Co., in Ohio. The accompanying illustration, made in the underground shop at Dun Glen



Hole cut in neck casting provides access to rail bolt.

No. 11 mine, shows how the hole was cut with a torch to allow repairmen to get at the bolt which holds the rail in place. Renewal of the rail formerly was classed as a "painful" job.

•

Reflector Buttons in Wood Make Trip Markers

Trip markers at the Powhatan Point (Ohio) mine of the Powhatan Mining Co. are made of reflector buttons set in oiled walnut disks which resist moisture and are bound in metal to prevent splitting. The

Powhatan Point trip marker in service. Note seat for triprider and his close-fitting dress.

markers are mounted on hooks which fit over the end of the car, as in the accompanying illustration. Since the markers are light, the triprider can slip the hook under his belt when changing trips, thus leaving his hands free for other work. The reflector buttons have a high visibility, and the markers, having no bulbs, glass covers or batteries to be damaged, are much more likely to be on hand 100 per cent of the time, in the opinion of mine officials.

•

Wheel Removal Facilitated By Two-Wheeled Dolly

One man, where two formerly were considered necessary, now can take heavy wheels and tires off the tractor-trailer haulage units at the Apex strip mine, Industrial Coal & Iron Co., Hopedale, Ohio, quicker and more safely by using a two-wheeled dolly specially made for the purpose. The dolly has a bent tongue and a curved skeleton body long enough to carry two wheels.

All tires on tractors and semi-trailers are 11.25x24-in. units. Mileage in 1940, largely due to the improved main roads employed, averaged 30,000 per tire. Vulcanizing dam-

With this dolly, one man removes a pair of wheels and tires without strain or danger.

Needles of coal puncture belt, let in acid

Former belts ruined; new Goodrich Cord Belt unharmed

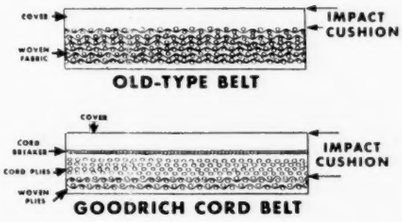
New principle of conveyor belt construction protects carcass. Also increases impact resistance many times. Less stretch. Fewer plies needed for any given stress. Many other important advantages.

THEY treat belts rough at this eastern power plant. Coal screenings, dumped in the river as waste years ago, are dredged up and carried by 1930 feet of conveyor belt to the bunkers. Thousands of wet coal particles, sharp as needles, cling to the belt — as it passes over the snubber pulley on the return journey—are ground into the belt cover.

Moisture with sulphuric acid content then enters these tiny holes. With former belts this acid reached and rotted the carcass, and the belts broke. But the B. F. Goodrich Cord Belt, after 2½ years' service, seems as good as new — because of its revolutionary construction.

New Principle of Conveyor Belt Design

In the Goodrich Cord Belt, only the two plies nearest the pulley are of woven fabric;



all other plies are of parallel cords each surrounded by rubber. These cord plies have practically the same resistance to impact as the cover.

Cover and special transverse cord breaker ply stop practically all cuts and gouges, but if they are penetrated such as in this severe power plant operation, moisture and acid cannot spread as they do through fabric plies — each Goodrich cord is surrounded by protective rubber. This explains why the Goodrich Cord Belt is as good as ever long after fabric belts had rotted out and broken.

Practically Stretchless

No Goodrich Cord Belt has ever stretched as much as ½ of 1%. The belt in the picture, 1930 feet long, operating at working stress of 45 lbs. per inch per ply, has stretched only 4 inches in 2½ years.

Cord belts trough perfectly because of their crosswise flexibility, even when made thicker and heavier than normal for woven-fabric belts. Thus longer belts can be used — fewer belts needed on long conveyor systems.

Because of its construction, ply separation in a B. F. Goodrich Cord Belt is impossible. Flexibility is increased many times. Adhesion of cover to carcass is 50% greater or more. Rubber in the cover cannot be distorted beyond its elastic limit.

For these and other reasons you will want to know, B. F. Goodrich Cord Belts are showing important increases in life, sharp cuts in cost, wherever they are used. Send for free folder explaining this important improvement in conveyor belt design. Write The B. F. Goodrich Company, Mechanical Goods Division, Akron, Ohio.

B.F. Goodrich

First IN RUBBER

(Another story of Goodrich development work appears on page 1)

ADVERTISING PAGE S REMOVED

Profits Per Ton
GO UP
As Replacement Costs
GO DOWN

Osmose treated ties were used in this incline to replace other ties which failed prematurely because of decay.

OSMOSE PROTECTION PAYS

Prominent mining companies from Alabama to the Rocky Mountain States have proved to themselves that the Osmose Natural Pressure Treatment is:

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Osmose Treated Timber lasts 3 to 5 times longer than untreated

ECONOMICAL
Complete treatment costs as little as $9.00 per thousand board feet

HARMLESS
Clean, dry, safe to handle, odorless and fire retardant

EASILY APPLIED
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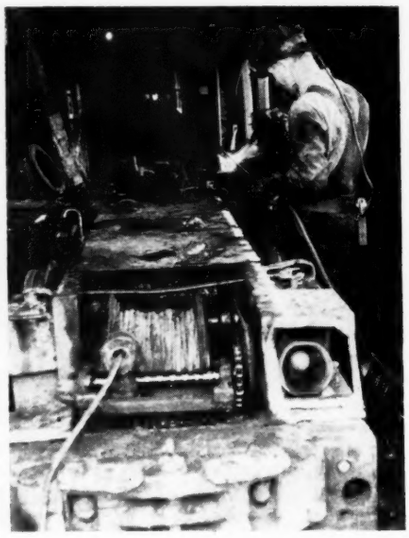
aged tires has been abandoned in favor of running them until they blow. New tires are put on the front wheels of the tractors and after a few thousand miles of service are switched to the double rear wheels of the tractor or the semi-trailer.

•

V-Belt Cable-Reel Drive Cuts Maintenance

A major item in reducing maintenance on gathering locomotives at Mine No. 6, J. H. Somers Coal Co., Adena, Ohio, is a V-belt cable-reel drive. First cost of the pulleys and their application in place of the sprockets and chain formerly used was negligible as compared with the savings from fewer delays plus elimination of new chain purchases.



In the shop for repairs but not on account of the cable-reel drive.

That the belt never flops off, as the chain is likely to do, is but one of the several advantages. A single belt ¾ in. wide has proved ample for this duty.

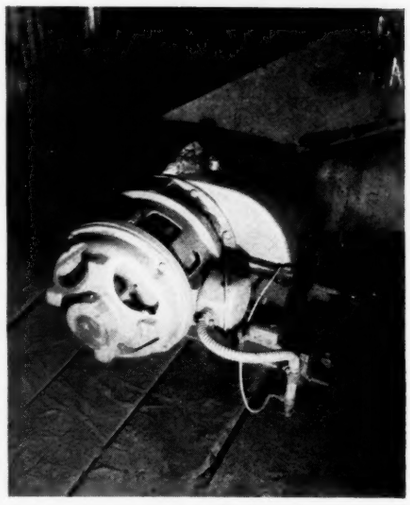
•

Careful Grounding of Motors Features Dun Glen No. 11

Since power delivery is not affected by the absence of grounding where alternating-current electrical equipment is used, neglect in electrical maintenance is most likely to involve ground connections. The first rule in insuring proper grounding is to follow in every case a standard and approved method in making the original installations.

Made in the Dun Glen No. 11 preparation plant of the Hanna Coal Co., the accompanying illustration shows how an approved grounding method was followed throughout the installation. The Westinghouse 10-hp. 440-volt gearmotor shown is grounded by a No. 8 BX wire from a case bolt to the rigid conduit, which in turn is grounded back at the distribution panel.

It is significant that in the case of this gearmotor two other grounds also exist: (1) the chain and (2) the Greenfield connection between the conduit and the motor entrance fittings. Then why the necessity for another



Grounded 440-volt gearmotor at Dun Glen No. 11.

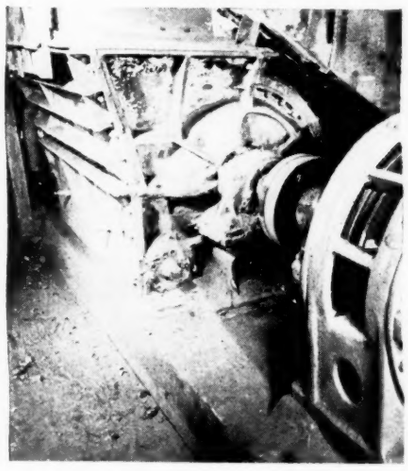
ground? The answer is that because some day the chain will be off temporarily during a maintenance job and because the Greenfield could come loose without affecting the power circuit.

•

Original Bearings Still Good In 1918 Crusher

That it pays to specify the most advanced features in new equipment to insure trouble-free operation is illustrated by a crusher installed in the preparation plant at No. 2 mine, Wheeling Township Coal Mining Co., Adena, Ohio. To date, this unit has handled 2,574,000 tons without any repair parts.

The crusher is an American Pulverizer Co. 60-S ring machine rated at 300 tons per hour when breaking 6-in. lump to minus ¾-in. screenings. An unusual feature for the day in which it was made was that the coal company engineer specified that Timken bearings be installed—the first such unit to be so equipped, according to information received from the manufacturer. The bearings comprise Cups Nos. 854 and Cones Nos. 862. Wear is indicated by the fact that to date the shims taken out of each bearing total only 0.015 in.



After 23 years, the anti-friction bearings in this crusher still are O.K.

WHAT'S NEW IN THE FIELD

Cooperative Plan for Promoting Solid-Fuel Use Offered by American Coal Foundation

ENLISTMENT of active support for a cooperative producer-wholesaler-retailer program for the promotion of domestic solid-fuel use was inaugurated with a series of meetings in Chicago, New York and Cincinnati in September under the auspices of the American Coal Foundation. This foundation, with headquarters in Chicago, was organized by the American Retail Coal Association in September, 1940, to study the problem of stimulating solid-fuel sales and develop a cooperative arrangement for attaining that objective. With Del Jacobus, president of the retail group, holding the same position with the foundation, Hilmer V. Swenson was appointed organization director and J. A. Cormack director of research. Calkins & Holden, of New York, were chosen advertising counsel.

Plan Already Tested

The proposed program, to which operators and wholesalers are asked to contribute 1c. per ton (domestic sizes only), to be matched by a similar contribution by retailers in centers where the plan is adopted, has been tested in typical communities in Illinois, Indiana, Michigan and Wisconsin and found workable, the foundation states. Test operation was preceded by a thorough study of consumer relations and opinion to determine the proper avenue of approach to the problem.

Every thinking coal man, it was brought out at the meetings, will say there is need for constructive sales effort in the domestic solid-fuel field. Oil and gas have forged ahead while coal has failed to capitalize on the many improvements in mining and preparation. Gas and oil, in fact, are not superior but have been presented to the public in much better fashion and consequently rate higher in public opinion. On the other hand, the foundation's investigation revealed, the public looks on coal as dirty, messy and hard work.

Public opinion of the coal industry has been molded by its only contact with the coal industry—the retail solid-fuel dealer. Progress in coal sales therefore necessitates changing the present public impression from unfavorable to favorable. To that end, the foundation proposes "Better Coal Service," on which tests were started about a year ago and have shown that it will do the job.

"Better Coal Service" is described as a method of improving the everyday operations and consumer contacts of the retail dealer to the end that a favorable public impression will be created. The service therefore provides for a continuing intensive educational program designed to help retailers improve and modernize their operations, including office, yard and delivery appearances and practices; public contacts; sales planning; promotion and advertising, etc. Provision is made for research into and development of new ideas in coal retailing, together with detailed and specific information and guidance on procedure.

The service also provides for setting up a competent, energetic field force to follow through on recommendations, to hold regular informative and checking-up meetings with dealer groups and yard employees, and to provide special assistance where required. To back up the other measures, the "Better Coal Service" plan provides for cooperative newspaper advertising and other publicity measures designed to educate fuel users in the advantages of coal heat in the home and stress the fact that "Coal Heat is Clean Heat." Identification of dealers and producers who cooperate with the foundation in the public interest also is included in the program.

Retail dealers in certain selected cities already have indorsed the plan, the foundation reports, and regular operation will be expanded as fast as the necessary producer, wholesaler and dealer support is provided. To finance the plan, retail dealers authorize producers and wholesalers to pay 1c. per ton to the foundation on purchases of domestic sizes. This dealer contribution is matched by a 1c. per ton contribution by the producers or wholesalers. No large sums are required to start the plan, as the money will be spent only where the plan is functioning, with new centers coming in only as retailers and producers serving them adopt the foundation program. Thus, there is no necessity for a national fund.

Affairs of the foundation will be administered by a board of directors made up of an equal number of producers and retailers. This board will decide all questions of foundation policies and activities. Foundation membership for producers is $100; for retailers, $10.

Foundation Platform

1. Public opinion is the big problem.
2. The retailer is the industry's contact with the public and the public's impression of the retailer and his methods also is its impression of the industry.
3. To change public opinion retail methods must be changed.
4. Although retailer is the contact, public opinion is the problem of the entire industry.
5. The dealer must have help in changing public opinion.
6. Improved retail methods will accomplish the result.
7. When a favorable opinion is created, it will be easier to sell more coal.
8. Public opinion can be changed by a cooperative producer-wholesaler-retailer promotional and advertising program.
9. The time to start is now.
10. A tested plan acceptable to the retailer already has been developed ready for the program to get under way.

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Utilization of Coal to Feature Joint Fuel Meeting

Better utilization of coal will be the theme at the joint meeting of the American Institute of Mining and Metallurgical Engineers Coal Division and the American Society of Mechanical Engineers Fuels Division to be held Oct. 30-Nov. 1 at the Hotel Easton, Easton, Pa. Dr. William Mather Lewis, president, Lafayette College, will deliver an address of welcome, to which there will be responses by J. E. Tobey, chairman, Coal Division, A.I.M.E., and William G. Christy, chairman, Fuels Division, A.S.M.E.

J. B. Morrow will preside at the first session, with A. W. Thorson as co-chairman, and these papers will be presented: "Application of Chemistry to Anthracite Mine Fire Problems," O. W. Jones and C. S. Scott, U. S. Bureau of Mines; "Domestic Stoker Coal Research," Walter Knox, research department, Koppers Co., and J. D. Doherty, research engineer, Koppers Coal Co.

Chairmen of the second session will be J. E. Tobey and R. M. Hardgrove, when there will be a "Symposium on Adjustment of Pulverized-Fuel-Burning Equipment," Henry Kreisinger, Combustion Engineering Co.; A. C. Foster, Foster-Wheeler Corporation; F. G. Ely, Babcock & Wilcox Co., and Ollison Craig, Riley Stoker Corporation.

At the third session J. E. Tobey will be chairman, with Martin A. Mayers as co-chairman, where there will be a "Symposium on Adjustment of Underfeed-Stoker-Fired Equipment," George P. Jackson, Combustion Engineering Co.; J. S. Bennett 3d, American Engineering Co., and R. A. Foresman, Westinghouse Electric & Mfg. Co.

David R. Mitchell will be chairman of the fourth session, assisted by L. A. Ship-

man, with these papers: "Effects of Changes of Moisture and Temperature on Mine Roof," I. Hartmann and H. B. Greenwald, U. S. Bureau of Mines; "Automatic Burning Control in Rotary Kilns," W. E. Reaser, professor of mechanical engineering, Lafayette College.

At the fifth session William G. Christy will preside, assisted by Henry F. Hebley, and these subjects will be considered: "Performance of Industrial Chain-Grate Stokers," J. H. Kerrick, Philadelphia & Reading Coal & Iron Co.; "Burning Pulverized Anthracite in Steam Power Plants," C. H. Frick, plant betterment engineer, Pennsylvania Power & Light Co.

There will be an informal dinner at 6:30 p.m. Oct. 30, at which Prof. Paul B. Eaton will preside and motion pictures will be displayed showing a study of anthracite combustion on small retorts. At the banquet, in the evening of Oct. 31, Howard N. Eavenson will be toastmaster and E. G. Bailey, vice president, Babcock & Wilcox Co., will speak on "Better Utilization of Coal." There also will be motion pictures of stoker-fired fuel beds of the Consolidated Edison Co. of New York.

Inspection trips will be made to the Alpha Portland Cement Co.'s Martins Creek plant, Lehigh Portland Cement Co.'s Sandts Eddy plant, Riegel Paper Corporation's Milford (N. J.) plant, Lehigh Navigation Coal Co.'s mine and preparation plant at Lansford, Pa., and the Pennsylvania Power & Light Co. plant.

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Illinois Institute to Consider Safety and Personnel

Safety in relation to mechanization and personal relations will highlight the 49th annual meeting of the Illinois Mining Institute, to be held Oct. 31 at the Hotel Abraham Lincoln, Springfield, Ill. Under the direction of President M. M. Leighton, director of the State Geological and Economic Survey, these papers will be presented: "Effects of Mechanization on Safety," C. A. Herbert, supervising engineer, U. S. Bureau of Mines, Vincennes, Ind.; "Personal Relations," Harry M. Moses, president, H. C. Frick Coke Co.; "Our Obligation to the State Conservation Department," Livingston E. Osborne, director, Department of Conservation of Illinois; "Legislative Trends," Walter Williams.

Dean C. M. Thompson, College of Commerce, University of Illinois, will preside as toastmaster at the banquet in the evening, when the guest speaker will be John D. Battle, executive secretary, National Coal Association.

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Penowa Erecting New Tipple

Work has been started on a new tipple at the Armide stripping operation of the Penowa Coal Co., near Raccoon, Pa. The new structure, which is being constructed by the Pittsburgh Industrial Engineering Co., will be a three-track plant with shaker screens, conveyors and loading boom, replacing one torn down last year. Stripping operations will begin as soon as the tipple is completed.

Washington Steps Up Blanket Priority Rating On Mine-Maintenance and Repair Parts

PRIORITY PLANS for speeding deliveries of maintenance parts and repair materials necessary for the continued operation of coal mines and a number of other essential industries were revised three times last month by OPM. The original order (*Coal Age*, September, 1941, p. 83) was withdrawn before effective. A "streamlined" plan followed on Sept. 9, and on Sept. 17 an order applying specifically to mining was issued. This order was amended slightly on Sept. 23.

Under the original order, promulgated Aug. 8, each mine or other unit in the essential industries covered was required to make individual application to OPM for a priority rating. When the thousands of applications for such ratings began to pour in on OPM, the Priorities Division found the paper work and administrative detail too great for expeditious handling. The Sept. 9 order eliminated the provision for individual priority certificates and permitted the buyer to certify that his order came within the scope of the regulations announced in the "streamlined" plan.

This method of certification is continued in the latest orders. Blanket priority, however, is stepped up from an A-10 to an A-8 rating. This priority also extends to the supplier of the materials. As in the original order, deliveries of materials for emergency repairs and maintenance may take an A-1-a rating. The Governor of each State is called upon to appoint an Emergency Coordinator of Mines who will furnish OPM with a list of active operations in his State. Each mine so listed is to receive a serial number to be shown on all its orders under the new plan.

The Emergency Coordinator also is to receive a list each month showing all purchases made by the mines under the terms of the order. He also is to report any excessive purchases or irregularities to OPM for investigation. Dr. Wilbur A. Nelson, who has been appointed Priorities Coordinator for Mines for OPM, will administer the order, which is officially designated "Preference Rating Order No. P-56—Part 982." The order of Sept. 9 was known as "Preference Rating Order No. P-22." The complete text of the order of Sept. 17, as amended by the supplemental order of Sept. 23, follows:

982.1—PREFERENCE RATING ORDER. For the purpose of facilitating the acquisition of material for the maintenance and repair of the property and equipment of, and for supplies for Mines, preference ratings are hereby assigned to deliveries of such material upon the terms hereinafter set forth, until such time as the Office of Production Management certifies specific quantities of such material to which the preference ratings herein assigned may be applied.

(a) *Definitions.*

(1) "Person" means any individual, partnership, association, corporation, or other form of enterprise.

(2) "Mine" means any plant actually engaged in the extraction by surface, open-pit or underground methods, or in the beneficiation, concentration or preparation for shipment of the products of mining activity. It does not include that form of mining known as "gold placer mining."

(3) "Mine Operator" means any person operating a Mine to whom a Mine Serial Number has been issued in accordance with the provisions of paragraph (b).

(4) "Supplier" means any person with whom a purchase order or contract has been placed by a Mine Operator or another Supplier for material

(i) required by a Mine Operator for maintenance, emergency repair, emergency inventory, or operating supplies of a Mine, or

(ii) to be physically incorporated in other material so required by a Mine Operator.

(5) "Material" means any commodity, equipment, accessories, parts, assemblies, or products of any kind.

(6) "Maintenance" means minimum upkeep necessary to continue the working condition of the essential operating equipment

Keeping Step With Coal Demand

Bituminous Coal Stocks

	Net Tons Aug. 1 1941	—P. C. Change— From July 1 1941	From Aug. 1 1940
Electric power utilities	10,431	+ 4.435	— 1.222
Byproduct coke ovens	6,215	+ 5.107	— 17.000
Steel and rolling mills	723	+ 0.416	+19.504
Railroads (Class 1)	7,001	+ 6.011	+33.607
Other industrials*	16,078	+14.646	+17.477
Total	40,448	+ 8.588	+ 7.752

Bituminous Coal Consumption

	Net Tons July 1941	—P. C. Change— From June 1941	From July 1940
Electric power utilities	5,220	+ 1.655	+35.327
Byproduct coke ovens	7,107	+ 3.676	+ 7.632
Steel and rolling mills	833	+ 0.725	+16.503
Railroads (Class 1)	7,799	+ 2.944	+22.031
Other industrials*	10,556	+ 9.935	+30.498
Total	31,515	+ 2.053	+21.788

* Includes beehive ovens, coal-gas retorts and cement mills.

Coal Production

Bituminous

Month of August, 1941, net tons	45,650,000
P.c. increase over August, 1940	17.021
January-Aug., 1941, net tons	314,352,000
P.c. inc. over Jan.-Aug., 1940	6.747

Anthracite

Month of August, 1941, net tons	5,246,000
P.c. increase over August, 1940	35.101
Jan.-August, 1941, net tons	35,878,000
P.c. inc. over Jan.-Aug., 1940	5.078

Sales of Domestic Coal Stokers Vs. Oil Burners

Sales	Coal Stokers	Oil Burners
July, 1941	26,046	18,454
P.c. inc. over July, 1940	57.235	17.196
January-July, 1941	90,643	110,553
P.c. inc. over Jan.-July, 1940	73.005	36.318

Index of Business Activity*

Latest week	154.8
Per cent change from month ago	— 1.464
Per cent change from year ago	+17.629

* *Business Week*, Sept. 20

Electrical Power Outputt

Week ended Sept. 13, kw.-hr.	3,281,290,000
P.c. change from month ago	+ 2.5
P.c. change from year ago	+17.7

† Edison Electric Institute.

Drainage Tunnel Diggers Uncover Old Mine

Workmen recently rediscovered one of the first coal mines operated on Vancouver Island. A city crew excavating a storm drainage tunnel in the Comox Road area of Nanaimo bored into a coal mine that produced coal over 80 years ago. The mine was discovered when experienced miners, who were working in the civic gang, noted noises such as might have been heard had the mine still been in operation. J. H. Shepherd, works manager, instructed the men to drive test holes, and when a heading in the old mine was encountered, J. McDonald, British Columbia Inspector of Mines, was called to the scene. Measures were taken to prevent the roof from caving.

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of a Mine at its then current rate of production.

(7) "Emergency Repair" means a restoration of Mine property which is necessary to reestablish Mine operation after a breakdown or suspension of operations because of damage, wear and tear, destruction of parts, or the like.

(8) "Emergency Inventory" means minimum inventory of material required to make reasonable advance provision for emergency repair of a Mine.

(9) "Operating Supplies" means material which is essential to and consumed in the operation of a Mine and which is generally classified as "mine supplies" or "mine stores."

(b) *Certification of Mines.*

(1) *Domestic Mines.* The agency designated by the Governor or other chief executive officer of each State, territory or possession of the United States shall furnish in duplicate to the Office of Production Management a certificate setting forth the names of the persons operating Mines within such State, territory or possession. The Office of Production Management will thereupon issue a Mine Serial Number, through such State agency, to each such person who may be approved by the Director of Priorities. Any person aggrieved by failure or refusal of a State agency to certify him as a Mine Operator may apply in writing to the Director of Priorities for issuance of a Mine Serial Number. The Director of Priorities may thereupon take such action as he deems appropriate.

(2) *Foreign Mines.* The Director of Priorities may, in his discretion, issue a Mine Serial Number to a person operating a Mine outside the limits of the United States, its territories and possessions.

(c) *Assignment of Preference Ratings.* Subject to the terms of this Order, the following preference ratings are hereby assigned, but nothing herein contained shall prevent the use of any other or higher rating to which any person may be entitled by reason of any other Preference Rating Certificate or Order.

(1) A-1-a to deliveries to a Mine Operator of material essential for emergency repair of a Mine, as approved by the Office of Production Management pursuant to paragraph (e) (1).

(2) A-8 to deliveries to a Mine Operator of material required for emergency inventory or for operating supplies or for maintenance of a Mine.

(3) A-8 to deliveries to a Supplier

(a) of material required by a Mine Operator for maintenance, emergency repair, emergency inventory or operating supplies of a Mine, and

(b) of material to be physically incorporated in other material so required by a Mine Operator.

(d) *Persons Entitled to Apply Preference Ratings.* The preference ratings hereby assigned may be applied by a Mine Operator or by any Supplier making to a Mine Operator or another Supplier deliveries of the kinds specified in paragraph (c) which have been rated pursuant to this Order.

(e) *Application of Preference Ratings.*

(1) A Mine Operator, in order to apply the A-1-a preference rating assigned by paragraph (c) (1), must communicate with the

LOOK AT THESE SAVINGS

. . . AMERICAN MINE DOOR'S

CONTRIBUTION TO PROFITS

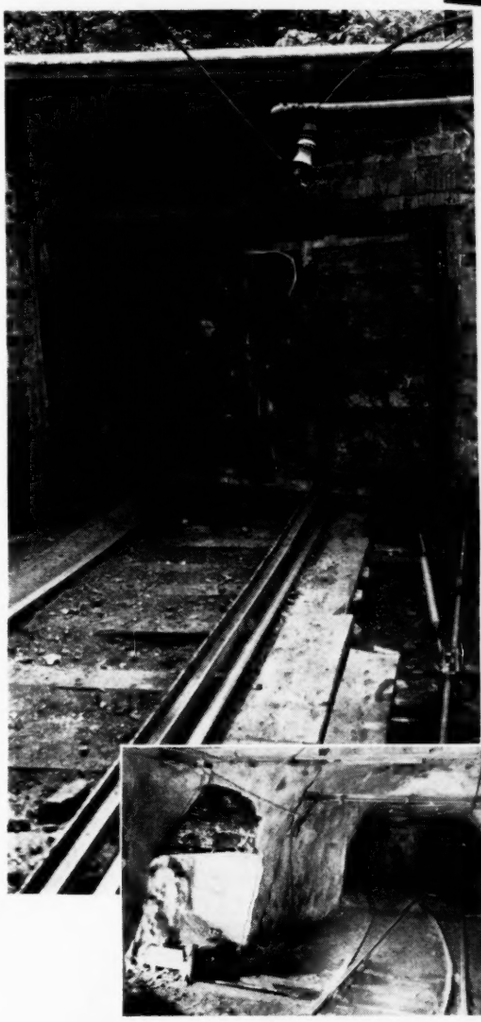
at the Blaine Mine in Eastern Ohio's Pittsburgh No. 8 Seam

INSTALLATION—

A dual set of AMERICAN MINE DOORS, one at the portal and one 1500 feet back on the main haulage way of the BLAINE mine of the Lorain Coal & Dock Co., forming a positive airlock.

SAVED . . .

1. The costly upkeep of a wasteful ventilation system. The positive airlock made it possible to install a much more efficient ventilating system that did away with delays to the locomotives.
2. The wages of two door trappers were eliminated . . . automatic opening and closing of doors was assured. Danger of air leakage and open doors was cancelled.



• In your search for tested methods of lowering your operating costs, make it a point to investigate the advantages of AMERICAN MINE DOORS as applied to your haulage ways. SURE to open. SURE to close.

Here is shown just one of many AMERICAN installations, that assures savings on labor and actual operating outlay (no delayed trips, better ventilation, etc.) for years to come.

With an all-over price spiral in the offing, it will pay you to consider AMERICAN MINE DOORS now! *Feel free to call in one of our engineers* to check your operations, then recommend the proper type of AMERICAN MINE DOOR. And, at the same time, ask him about other AMERICAN products such as the "ELECTRI-THROW" Track Switch. *All are built to save you money.* Write, wire or phone today!

. . . AT THE WILLOW GROVE MINE, IT'S AN AMERICAN MINE DOOR CO. "ELECTRI-THROW" SWITCH!

Throwing the switch electrically eliminates the stopping of the trip, the actual switch throwing and the re-starting of the trip . . . a definite saving over a long period. It's another AMERICAN MINE DOOR contribution to lower cost operations.

AMERICAN MINE DOOR COMPANY

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YES, 40 YEARS
is a long time—

MINERS OF COAL — MANUFACTURERS OF COKE

NORTON COAL COMPANY
INCORPORATED
W. J. WILLITS AND G. C. McCALL, RECEIVERS
NORTON, VIRGINIA

January 31, 1941

The Provident Life & Accident Co.

Chattanooga, Tennessee.

Gentlemen: -

In looking over some old records this morning, I find that we have carried your insurance for employees for forty years, and I was very much impressed at the thought of two companies having close business relations over such a long period of time.

Our men, as a whole, have been pleased with their insurance over this period and seem to prefer it over other insurance that has been offered them from time to time, and I might say that we find this insurance a great help to our company in taking care of employees when they are off from work due to sickness or injury.

Another feature of your service that is appealing is the fact that your representative calls at the plant frequently, practically every week and on occasions more often, settles the claims right on the spot, which means quick payment of claims and personal contact which is very much better than correspondence.

I hope the days of our working together will be many more - yes, even many more years.

Yours very truly,

W. J. Willits

The Provident hopes to continue meriting this spirit of appreciation from a company with which it has been having business dealings for more than forty years.

Since 1887, the Provident has held steadfastly to its original goal in meeting all obligations promptly, fairly and squarely. Similar pleasant relations with other leading coal producers have existed over long periods of years, for which we are grateful.

The Home of

PROVIDENT
LIFE AND ACCIDENT INSURANCE COMPANY

CHATTANOOGA TENNESSEE

Since 1887

Specialists in HUMAN SECURITY Plans for Coal Mine workers for more than a half-century

Office of Production Management, describing the material essential for emergency repair and the nature of the emergency necessitating such repair. The Office of Production Management will notify such Mine Operator whether, and to what extent, his application is approved, and a copy of such notification shall be furnished by the Mine Operator to his Supplier to evidence the A-1-a rating.

(2) A Mine Operator or a Supplier, in order to apply the A-8 preference rating assigned by paragraph (c) (2) and (3), must indorse the following statement on the original and all copies of each purchase order or contract for material, the delivery of which is entitled to such preference rating:

"Purchase order for Materials for a Mine rated pursuant to Preference Rating Order P-56. Mine Serial No. ...., Rating A-8. This application of the rating is made pursuant to the terms and conditions of that Order, with which the undersigned is familiar.

_____
(Name of Mine Operator or Supplier)

By: _____
(Authorized Signature)

Such purchase order or contract so indorsed shall be delivered to the seller of such material. Such indorsement shall constitute a certification to the Office of Production Management that the Mine Operator or Supplier is entitled to apply such rating to such delivery pursuant to this Order. Such purchase order or contract must be in writing and shall not include any material the delivery of which is not rated pursuant to this Order.

(2) A Mine Operator or Supplier placing any such rated purchase orders or contracts and the Supplier selling the material covered thereby, must each retain indorsed copies of such purchase orders, contracts notifications and other relevant documents segregated from all other purchase orders or contracts for a period of two years from the date thereof for inspection by authorized representatives of the Office of Production Management.

(f) *Restrictions on Application of Rating.* The preference ratings hereby assigned shall not be applied

(1) unless the material to be delivered cannot be secured when required without such rating;
(2) to obtain deliveries greater in quantity or on dates earlier than required for the operation, maintenance or repair of Mine property or equipment;
(3) by a Supplier to obtain material for a delivery by him which has not been rated pursuant to this Order.

(g) *Restrictions on Inventory.* No Mine Operator shall accept deliveries (whether or not rated pursuant to this Order) of operating supplies or other material which will increase such Mine Operator's inventory of such operating supplies or other material to an amount greater than the minimum necessary for the efficient operation of his business, and the ratio of inventory to current production shall in no event exceed the ratio of average inventory to average production for the years 1938, 1939, and 1940.

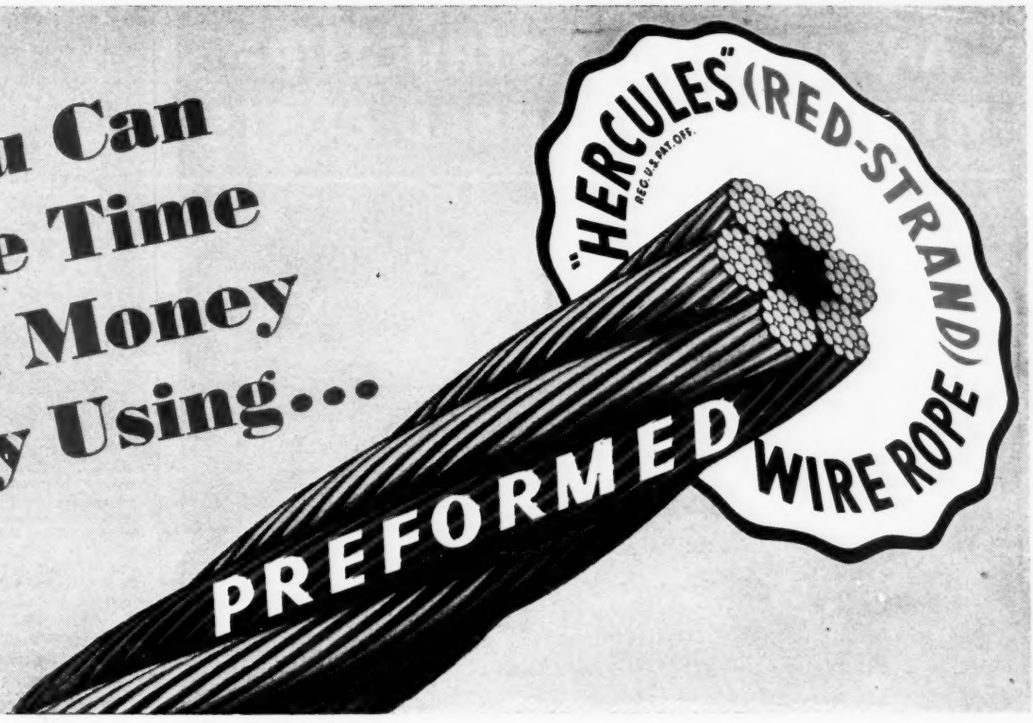
(h) *Resale of Operating Supplies and Other Material Prohibited.* Except with specific permission of the Director of Priorities, no Mine Operator shall resell any operating supplies or other materials (whether or not obtained pursuant to rating assigned by this Order) except to another Mine Operator.

(i) *Conservation and Standardization.* Every person affected by this Order shall use his best efforts to effectuate conservation of materials by elimination, simplification or standardization of types, sizes or forms, or otherwise, and to cooperate in any program developed for such purpose by the Office of Production Management. The Director of Priorities may from time to time issue specific directions as to conservation, elimination and standardization.

(j) *Relief.* In case the productivity or sound working condition of any Mine is adversely affected by any provision or application of this Order or by inability to obtain essential operating supplies or other materials, such Mine may apply for relief to the Director of Priorities. The Director of Priorities may thereupon take such action as he deems appropriate.

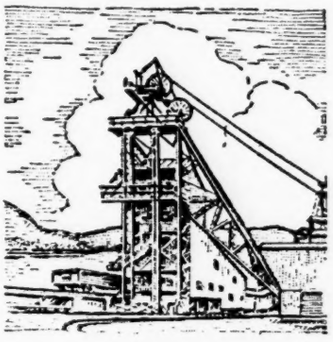
(k) *Records, Audit and Reports.* Each Mine Operator and each Supplier shall keep and preserve for a period of not less than two years accurate and complete records of all transactions affected by this Order and shall submit from time to time to audit and inspection by duly authorized representatives of the Office of Production Management. Each Mine Operator and each Supplier shall execute and file with the Office of Production Management

You Can Save Time And Money By Using...



Now that continuous and efficient production is more important than ever, are you cashing in on the advantages of Preformed "HERCULES" (Red-Strand) Wire Rope? Actual records show that its easy handling, smooth spooling and long life mean a definite saving in both time and money.

When you buy Preformed "HERCULES" (Red-Strand) Wire Rope, you get a Preformed wire rope of the very highest quality — not only as to quality of material, but fabrication as well. As it is furnished in both Round Strand and Flattened Strand constructions, there is a right rope for every heavy duty purpose.



Why not take advantage of the time and money saving possibilities of Preformed "HERCULES"? Try it, then compare its performance record with that of any other rope you have ever used.

We especially recommend the Preformed type of "HERCULES" (Red-Strand) Wire Rope for use on clamshells, cranes, loaders, mining machines, scrapers and shovels.

A. LESCHEN & SONS ROPE CO.

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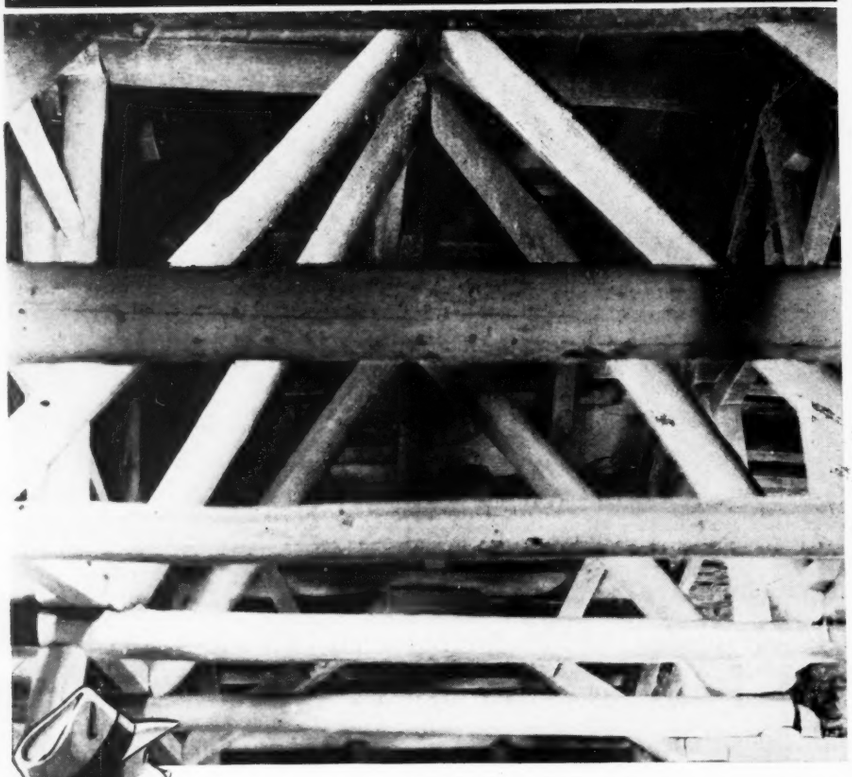
AN *OVERHEAD* STRUCTURE WITH LOW *OVERHEAD* COSTS



IT'S TREATED WITH "CZC" FOR *TRIPLED* LIFE!

WHEN YOU CAN COUNT on timber lasting for many years — you can see why it will save you money on maintenance.

That's the life you can expect from timber treated with "CZC", because it lasts many times longer than untreated wood. This treatment also gives the plus advantages of timber that's fire retardant, clean and odorless, permitting safety in handling and avoiding confusing odors foreign to mines.

You'll find "CZC" treatment a wise investment for cribbing, lagging, shaft timbers, air course timbers, props, haulage way ties, and fire stops.

Send today for our free booklet, "Wood Preservation for Mines". Then put the CZC Factor of Safety to work . . . saving money for *you*!

E. I. du Pont de Nemours & Co. (Inc.), Grasselli Chemicals Department, Wilmington, Delaware.

SPECIFY LUMBER TREATED WITH

DUPONT REG. U.S. PAT. OFF. **CZC**

CHROMATED ZINC CHLORIDE

or other designated agency, such reports and questionnaires as the Office of Production Management shall from time to time require. Until otherwise directed, each Mine Operator shall file with the designated state agency on or before the 10th day of each month, beginning Oct. 10, 1941, a report of purchases made during the preceding month pursuant to the ratings granted by this Order.

(l) *Violations.* Any person affected by this Order who violates any of its provisions or a provision of any other Order, regulation or other directive of the Office of Production Management may be deprived of priorities assistance, or subjected to such other or further action as the Director of Priorities may deem appropriate.

(m) *Revocation or Modification.* This Order may be revoked or modified by the Director of Priorities at any time as to any Mine Operator or Supplier. In the event of revocation, or upon expiration of this Order, deliveries already rated pursuant to this Order shall be completed in accordance with said rating, unless the rating has been specifically revoked with respect thereto. No additional applications of this rating to any other deliveries shall thereafter be made by the Mine Operator or Supplier affected by said revocation or expiration.

(n) *Amendment of Prior Order.* The provisions of Preference Rating Order P-22 shall not apply to deliveries to which a preference rating is assigned by this Order.

(o) *Effective Date.* This Order shall take effect immediately, and unless sooner revoked shall expire on the 30th day of April, 1942.

Emergency mine coordinators had been appointed in 39 states up to Oct. 1. The list is as follows:

Alabama—W. J. McCrossin, Phoenix Building, Birmingham.
Arizona—C. M. Martin, 1821 East Jackson St., Phoenix.
Arkansas—George C. Branner, 447 State Capitol, Little Rock.
California—Kenneth R. Fulton, State Capitol, Sacramento.
Florida—Herman F. Gunter, Box 631, Tallahassee.
Georgia—Garland Peyton, State Capitol, Atlanta.
Idaho—C. E. Arney, State Capitol, Boise.
Illinois—Robert M. Medill, State Capitol, Springfield.
Indiana—Clarence A. Jackson, Board of Trade Bldg., Indianapolis.
Iowa—George Duckworth, State Capitol, Des Moines.
Kansas—Jeff Robertson, 801 Harrison St., Topeka.
Kentucky—Moss G. Patterson, Box 680, Lexington.
Louisiana—Joseph L. Michugh, State Capitol, Baton Rouge.
Maryland—John J. Rutledge, State Office Building, Annapolis.
Michigan—Benjamin F. Sparks, State Highway Department, Escanaba.
Minnesota—Ray Nolan, Hibbing.
Mississippi—Lea D. Robinson, Defense Council, Jackson.
Missouri—John A. Skinner, Bureau of Mines, Jefferson City.
Montana—Tom D. Caverly, State Capitol, Helena.
Nebraska—Blain Yoder, State Capitol, Lincoln.
Nevada—Matt Murphy, State Capitol, Carson City.

Coming Meetings

- Coal Producers' Association of Illinois: annual meeting, Oct. 14, Springfield, Ill.
- Ohio Valley Section, A.I.M.E., and Open Hearth Steel Committee: Oct. 17-18, Columbus, Ohio.
- Fifth annual joint Fuels Conference under auspices of Coal Division of A.I.M.E. and Fuels Division of A.S.M.E.: Oct. 30-Nov. 1, Hotel Easton, Easton, Pa.
- Illinois Mining Institute: 49th annual meeting, Oct. 31, Hotel Abraham Lincoln, Springfield, Ill.
- West Virginia Coal Mining Institute: annual meeting, Nov. 7 and 8, Hotel Morgan, Morgantown, W. Va.

H. E. Ostin

H. E. Ostin Is Dead

H. E. ("Red") Ostin, sales representative for *Coal Age* and *Engineering and Mining Journal* in the Chicago territory, died suddenly on Sept. 20 of a heart attack. He joined the McGraw-Hill Publishing Co. Dec. 1, 1927, as a member of the advertising staff of *Factory*, being transferred to the mining papers eight years later.

New Jersey—Meredith E. Johnson, State House Annex, Trenton.
New Mexico—John M. Kelly, State Capitol, Santa Fe.
New York—Frieda S. Miller, 80 Centre St., New York.
North Carolina—J. I. Stuckey, State Capitol, Raleigh.
North Dakota—W. T. Kraft, 315 Broadway, Bismarck.
Ohio—George Strain, Department of Industrial Relations, State Capitol, Columbus.
Oklahoma—Ivan Fisher, Miami.
Oregon—Earl K. Nixon, State Capitol, Salem.
Pennsylvania—Richard Maize, secretary, Department of Mines, Harrisburg.
South Dakota—Harry H. Stewart, Deadwood.
Tennessee—S. E. Bryant, State Capitol, Nashville.
Texas—John W. Kidd, El Paso.
Utah—Wendell Grover, State Industrial Commission, Salt Lake City.
Vermont—Lester E. Richwagon, State Capitol, Montpelier.
Virginia—Thomas B. Morton, State Capitol, Richmond.
Washington—Robert H. Harlin, State director, Labor and Industry, Olympia.
West Virginia—N. P. Rhinehart, chief, Department of Mines, Charleston.
Wyoming—J. M. Sampson, Rock Springs.

•

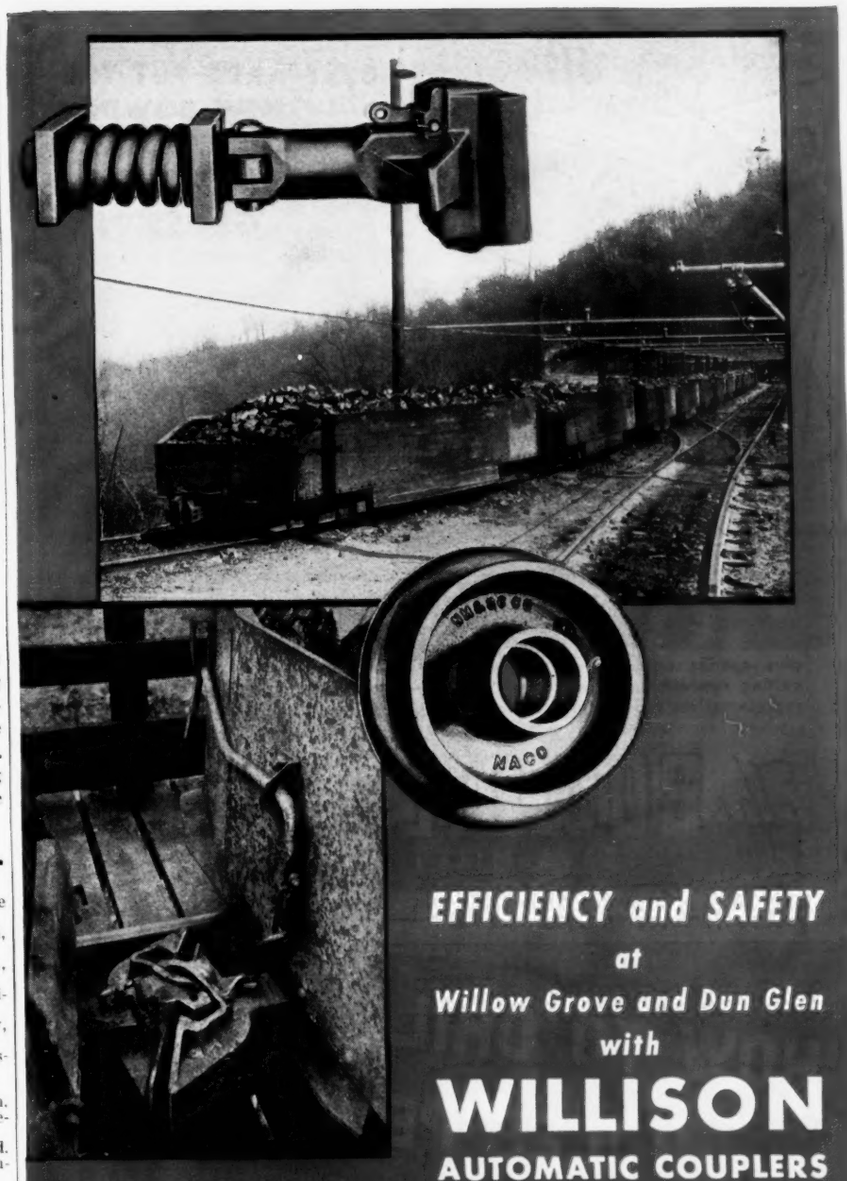
Panther Creek No. 2 Resumes

No. 2 mine of Panther Creek Mines, Inc., Springfield, Ill., resumed operations Sept. 2 with more than 200 men at work. The mine had been shut down for three months.

•

To Hold King Coal Festival

A three-day festival in honor of "Old King Coal" will be put on Oct. 16-18 at West Frankfort, Ill. Features of the celebration will be an exhibition of Franklin County coal products, free entertainment, a display of coal derivatives, "queens" from towns throughout the county, and the crowning of Old King Coal.



EFFICIENCY and SAFETY
at
Willow Grove and Dun Glen
with
WILLISON
AUTOMATIC COUPLERS

After almost ten years of most satisfactory service at Willow Grove Mine, Willison Automatic Couplers were the choice of the Hanna Coal Company for their Dun Glen property. With the trend towards high capacity cars, rapid handling and greater stress on safety, Willison Automatic Couplers are meeting the demands of modern mechanized mining.

Rotary Dumping is easily and safely accomplished with Willison Automatic Couplers without uncoupling.

As a companion of the Willison Automatic Coupler, Naco Steel wheels are showing fine performance records and are used at both of the above Hanna properties.

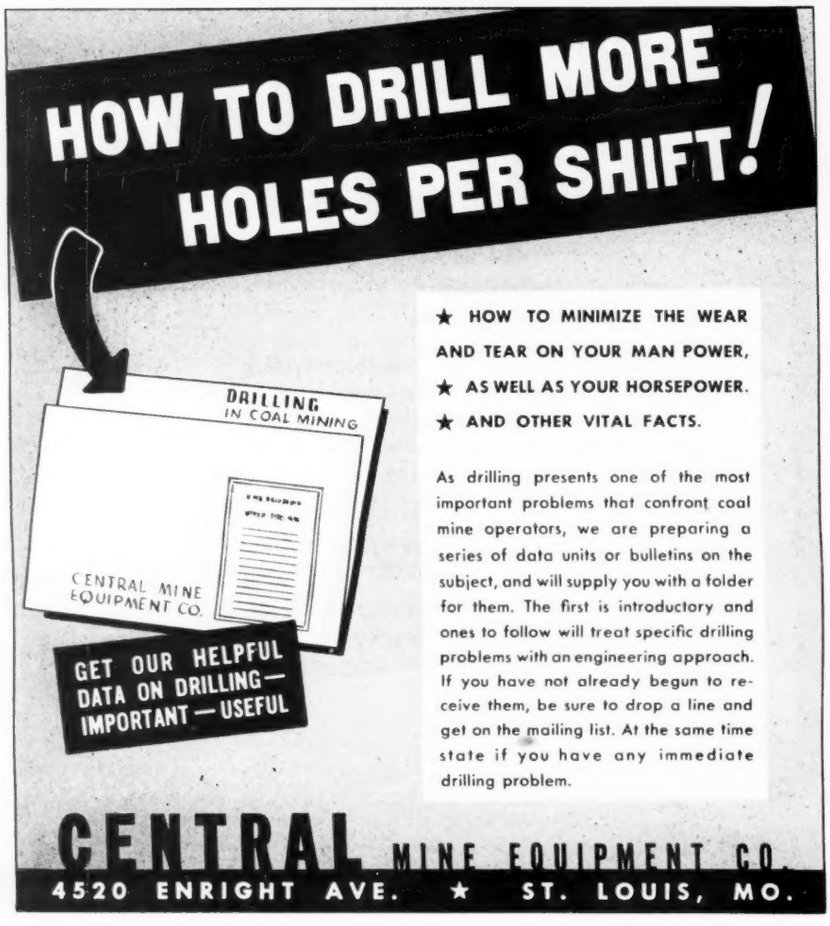
Write for detailed information.

NATIONAL MALLEABLE AND STEEL CASTINGS CO.
General Offices: CLEVELAND, OHIO
Sales Offices: New York, Philadelphia, Chicago, St. Louis, San Francisco.
Works: Cleveland, Chicago, Indianapolis, Sharon, Pa., Melrose Park, Ill.

JIM SLIM says: "LET'S PUT THE NEW BOWDIL CUTTER CHAIN 'UNDER THE GLASS'"!
A closeup view of the new BOWDIL Cutter Chain will prove its many advantages . . . and the best way to get an accurate account of this better chain's economies is to try it on your own operations. Why not put it to work for you at once?

There are many new, and many "proved-through-use" features incorporated in this new BOWDIL Chain. Connections are large, positive bushings . . . body sections are drop-forged steel, of a design that distributes rather than concentrates stresses . . . bit carrying lugs are securely welded on. Long life, plus superior service while in use, make this chain the ultimate in efficient coal cutting operations. Write for a descriptive bulletin, or call in one of our representatives for a demonstration.

The BOWDIL Company
Canton COAL CUTTING EQUIPMENT Ohio


HOW TO DRILL MORE HOLES PER SHIFT!
DRILLING IN COAL MINING
CENTRAL MINE EQUIPMENT CO.
GET OUR HELPFUL DATA ON DRILLING— IMPORTANT—USEFUL
★ HOW TO MINIMIZE THE WEAR AND TEAR ON YOUR MAN POWER,
★ AS WELL AS YOUR HORSEPOWER.
★ AND OTHER VITAL FACTS.
As drilling presents one of the most important problems that confront coal mine operators, we are preparing a series of data units or bulletins on the subject, and will supply you with a folder for them. The first is introductory and ones to follow will treat specific drilling problems with an engineering approach. If you have not already begun to receive them, be sure to drop a line and get on the mailing list. At the same time state if you have any immediate drilling problem.
CENTRAL MINE EQUIPMENT CO.
4520 ENRIGHT AVE. ★ ST. LOUIS, MO.

Anthracite Price Ceiling Is Set, Then Revoked by Henderson

Leon Henderson, head of the Office of Price Administration, on Sept. 17 revoked a price-ceiling schedule on anthracite after conferring with leading Pennsylvania hard-coal operators who had ignored his order of Sept. 12 forbidding a 15c. per ton advance which became effective three days later. Although Administrator Henderson condemned the action of the producers in defying his price-ceiling order, he rescinded his fixing of prices at levels prevailing on Aug. 15 following submission of comprehensive data supporting the price advance.

The operators agreed not to take any further action relative to price advances without prior consultation with and approval of OPA. Mr. Henderson informed the producers that their action in putting the advances into effect represented a wholly unjustifiable act of defiance and one that would not be tolerated in the future. In announcing a price schedule of $6.60 a ton, f.o.b. mine, for broken, egg, stove and chestnut sizes; $5.50 for pea, $3.50 for No. 1 buckwheat, $2.90 for rice and $2.15 for barley, the Price Administrator said on Sept. 12 that the operators had failed to supply information in the form asked, by individual companies, in support of their plan to advance the price of domestic sizes by 15c. a ton.

The operators present at the Sept. 17 meeting, who agreed that in the future they would make every effort to cooperate with OPA, included: C. F. Huber, chairman of the board, Glen Alden Coal Co.; F. W. Leamy, vice president, Hudson Coal Co.; Donald Markle, president, Jeddo-Highland Coal Co.; J. B. Warriner, president, Lehigh Navigation Coal Co.; L. R. Close, president, Lehigh Valley Coal Co.; H. J. Connolly, president, Pennsylvania Coal Co.; C. W. Stone, sales manager, Susquehanna Collieries Co.; and R. E. Taggart, president, Philadelphia & Reading Coal & Iron Co.

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Canadian Collieries Buys Plant

Canadian Collieries (Dunsmuir) Ltd. has purchased the coal properties of the McLeod River Hard Coal Co., Mercoal, Alta., west of Manitoba, according to H. R. Plommer, general manager of the former company. The McLeod property has an output of about 700 tons daily, but Mr. Plommer says that with proper equipment this could easily be increased to 2,000 tons daily.

•

New Preparation Equipment

Eagle Hill Coal Co., Mill Creek, Pa.—Contract closed with Wilmot Engineering Co. for three Type D jigs to prepare nut, pea and buckwheat sizes of anthracite; total capacity, 60 t.p.h. of clean coal.

New River & Pocahontas Consolidated Coal Co., No. 9 Mine, Havaco, W. Va.—Contract closed with McNally-Pittsburg Mfg. Co. for McNally-Norton compound automatic washer to clean 175 t.p.h. of 6x$\frac{3}{8}$-in. coal, with screening arrangement for

classifying into five sizes and with complete crushing and mixing facilities for preparing special shipments.

RALEIGH COAL & COKE CO., Mine No. 7, Raleigh, W. Va.—Contract closed with Jeffrey Mfg. Co. for washing plant for mine-run coal; capacity 150 t.p.h. of raw coal feed.

•

Roebling Company Celebrates Century of Service

John A. Roebling's Sons Co. celebrated its 100th anniversary Sept. 19 with a tour of its Trenton and Roebling mills and a dinner at Nassau Tavern, Princeton, N. J., at which more than 100 editors and publishers of industrial magazines from all parts of the country were its guests. Leon Henderson, administrator, OPA, and the principal speaker at the commemorative dinner, paid tribute to the founders of the country as exemplars of the American system of free enterprise.

The founder of the company, he declared, "was a rebel against the hatred and the malignancy which prevailed in the Germany of a century ago and which Hitler has brought to life again. It was in protest against that tyranny that John and his brother Karl came to the United States." Today the company stands as "a symbol of those principles which have made it possible for free men to establish free enterprises and prosper in a free country." Without the preservation of those principles the American way of life would be doomed.

Advisory Group Formulates Inspection Policies; Forbes Named Chief Inspector

POLICIES and procedures with which to inaugurate activities under the Federal Coal Mine Inspection Act were formulated at a meeting Sept. 3 in Washington, D. C., of the Advisory Committee on Coal Mine Inspection with Assistant Secretary of the Interior Oscar L. Chapman; Dr. R. R. Sayers, Director of the Bureau of Mines, and other representatives of the Bureau. It was announced that coal-mine inspections and investigations would be undertaken soon after Oct. 1. Selection of an initial staff of inspectors was to be made immediately, and within a few weeks the force begin an intensive training program at the Central Experiment Station of the Bureau, Pittsburgh, Pa., after which the inspectors are to be sent to various headquarters in the field.

The plan calls for hiring a staff of 107 inspectors, 5 electrical engineers, 5 explosives engineers, and a number of administrative personnel during the remainder of the current fiscal year.

The Advisory Committee decided that immediately following an inspection of a mine the inspector should post at the mine mouth a preliminary report consisting of a summary of conditions and practices which he feels need immediate attention. The inspector then will make a detailed report to the engineer in charge of the district in which he is located. Copies of this report, after review by main headquarters in Washington, will be furnished to the operator, representatives of the labor unions, and the State Department of Mines. Copies of the report or summaries thereof also may be made available to State compensation commissions, insurance associations, health and safety organizations, labor periodicals, trade journals, newspapers and others who may request the information.

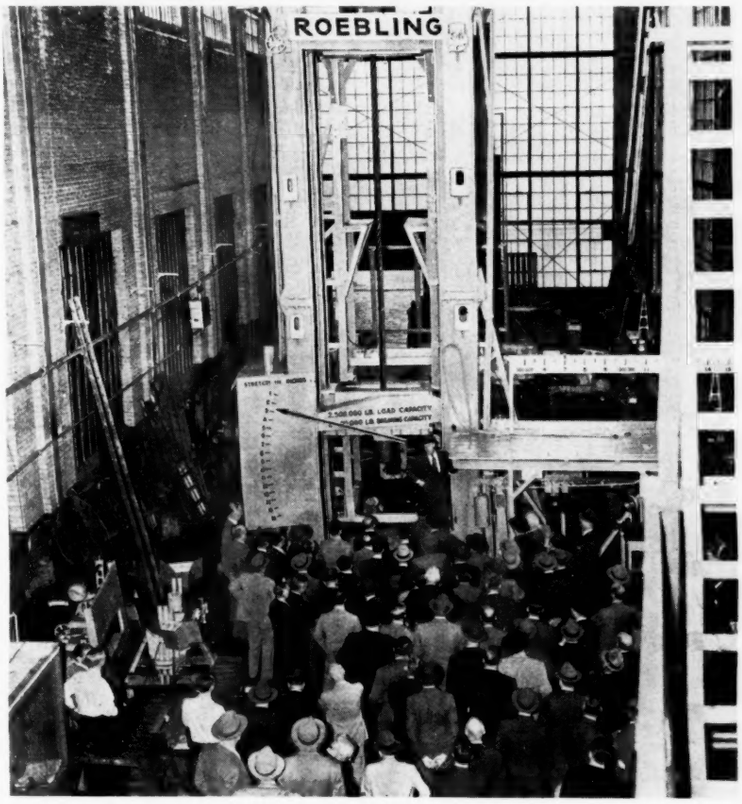
John J. Forbes

Newly appointed chief mine inspector to supervise activities under the Federal Coal Mine Inspection Act.

Appointment of John J. Forbes, supervising engineer of the Safety Division, U. S. Bureau of Mines, as chief mine inspector of the Bureau to supervise activities under the new Federal Coal Mine Inspection Act was announced Sept. 13 by Secretary of the Interior Harold L. Ickes. Mr. Forbes brings to his new post about 30 years' experience as a mining engineer and as an exponent of mine safety. He started in mining as a breaker boy in the anthracite region in the '90's when he was but 10 years old and, until he joined the Bureau of Mines 26 years ago, worked in various capacities in a number of mines in Pennsylvania and Ohio.

He was born Nov. 21, 1885, in Shamokin, Pa., into a family which for generations had been engaged in the mining of coal. He was educated in the public schools of Shamokin and the State Normal School, Kutztown, Pa. After a brief career as teacher and principal in the Shamokin public school he entered Pennsylvania State College, from which he was graduated in 1911 with a B.S. degree in mining engineering.

In 1915 Mr. Forbes entered the federal government service as first-aid miner with the Bureau of Mines. He was successively promoted to foreman miner, junior mining engineer, mining engineer, senior mining engineer, and principal mining engineer in charge of supervising the work of the Safety Division. Under his supervision more than 1,000,000 men in the mining industry have been given courses in first aid and over 50,000 have been given Bureau certificates for having completed courses in mine-rescue



Eighty-five publishers and editors watch the breaking test on a 4-in. rope used on a stripping shovel by Midland Electric Coal Corporation. The rope, after stretching 11 in., finally broke at an approximate 800-ton pull.

Advisory Committee counsels on inspection policies

Left to right: J. J. Forbes, supervising engineer, Safety Division, U. S. Bureau of Mines; Dan Harrington, Chief, Health and Safety Branch; John T. Jones, president, District 16, United Mine Workers, and director, Labor's Non-Partisan League; Thomas Kennedy, secretary-treasurer, U.M.W.; Dr. R. R. Sayers, Director, U. S. Bureau of Mines; Oscar L. Chapman, Assistant Secretary of the Interior; T. J. Thomas, president, Valier Coal Co.; Cadwallader Evans, Jr., vice-president and general manager, Hudson Coal Co.; L. C. Campbell, general manager, Koppers Coal Co.; H. H. Schrenk, chief, Health Division, Bureau of Mines. Percy Tetlow, industrial representative, U.M.W., the sixth member of the Advisory Committee, was unavoidably absent from the meeting.

work. In the promotion of mine safety he has cooperated closely with mine operators and heads of mine workers' organizations, as well as with the officials of State mining departments.

Tentative distribution of the initial 107-man inspection force in the field will be made as follows: District A—Pittsburgh, Pa., covering western Pennsylvania, Maryland, northern West Virginia and eastern Ohio—34 inspectors; District B—Wilkes-Barre, Pa., covering eastern Pennsylvania—8 inspectors; District C—Mount Hope, W. Va., covering southern West Virginia, Virginia, and eastern Kentucky—30 inspectors; District D—Birmingham, Ala., covering Alabama, Tennessee, North Carolina and Georgia—7 inspectors; District E—Vincennes, Ind., covering Indiana, western Ohio, Illinois, Kentucky, Missouri and Iowa—16 inspectors; District G—McAlester, Okla., covering Oklahoma, Kansas, Arkansas and Texas—2 inspectors; District H—Salt Lake City, Utah, covering Western States—10 inspectors. The inspection force in each district will report directly to the district engineer, who in turn will report to the Chief Mine Inspector.

Activities under the Coal Mine Inspection Act will be carried on by a new mine inspection division to be placed in the Health and Safety Branch of the Bureau of Mines. Congress has appropriated $729,000 with which to launch the inspection and investigation program.

In addition to mine inspectors, the Bureau, in accordance with the mandate laid down by Congress, will collect, compile, analyze and publish statistical data relating to coal-mine accidents. The Bureau also will make investigations into occupational diseases and such other investigations which will help to promote health and safety in the coal mines of the United States.

As announced Aug. 23 (*Coal Age*, September, 1941, p. 81), the Advisory Committee on mine inspections is composed of: Percy Tetlow, industrial representative, United Mine Workers; Thomas Kennedy, secretary-treasurer, U.M.W.; John T. Jones, president, District 16, U.M.W., and director, Labor's Non-Partisan League; Cadwallader Evans Jr., vice president and general manager, Hudson Coal Co.; L. C. Campbell, general manager, Koppers Coal Co.; T. J. Thomas, president, Valier Coal Co.

Seeks Help in Finding Jobs For Discharged Draftees

Declaring that the selective service system will give the same assistance in finding jobs for men completing service in the regular Army, Navy or Marine Corps as it does to its own selectees and members of the National Guard, Brig. Gen. Lewis B. Hershey, Director of Selective Service, urges the cooperation of all employers to see that every returning soldier is given prompt and proper civilian employment.

"Every employer," he said, "should show his own patriotic conception of proper cooperation for national defense by not only reinstating his former employees as they return to civil life but also by giving employment to as many as possible of those returning soldiers who have no jobs awaiting them." Employers can best aid to reestablish returning soldiers in civil life, he added, by working with the reemployment committeemen of their local selective service boards and with their State employment offices. He suggested that they immediately advise these agencies of all jobs they have available and continue to do so from time to time.

Gadgets and Old Timers Capture Awards At Seventh Appalachian Exhibition

BLUEFIELD, W. Va., was the hub of the Southern coal fields on Aug. 21, 22 and 23 by reason of the seventh annual Southern Appalachian Industrial Exhibition, where 150 booths were crammed with machines, supplies and mining industry services representing at least 170 manufacturers and other organizations. Total attendance was estimated at 15,000 and on Saturday, the last day, the aisles between booths in the Norfolk & Western Ry. terminal, where the exhibit was housed, were overcrowded. Twelve cash prizes were given to winners in a gadget contest and 85 cash awards made to entries in the Pioneer Miners' Club, the entrance requirement of which is 40 years or more served in the coal industry.

First prize of $25 was awarded to the gadget of H. K. Mundorff, Inland Steel Co., Wheelwright, Ky., consisting of a safety fused junction box for mechanized mining. The judging for second resulted in a tie; therefore two $15 awards were made. One went to Harry Caldwell, Koppers Coal Co., Kopperston, for a safety lock device for a cutter chain and the other to Frank Hill, colored, former miner and now a messenger in the State Senate, for a mine safety post which upon compression rings a bell and lights a warning signal lamp.

Prizes of $5 each were given to the following: Charles R. Wilson, Stone, Ky., automatic safety coupler for mine cars; J. A. Sanner, Page Coal & Coke Co., closed frog switch; Thomas B. White, Pocahontas Fuel Co., automatic charging position indicator for lamp rack; P. S. Davis, Marlan-Rockwell Corporation, clamp for trailing cable; and M. C. Holder, American Coal Co., shooting cable safety reel. Winners of $2.50 each were: Peter Troske, Pocahontas Fuel Co., rope-propelled scooter for man travel on haulways in low coal; Adam Fulford, American Coal Co., car scotch; E. L. Salyers, Wise Coal & Coke Co., level platforms for loading boom picking (*Coal Age*, June, 1941, p. 83); and Elbert Cleary, Winding Gulf Collieries, check lock for mine car.

The industrial exhibit, directed by B. B. Housman, was sponsored by the Pocahontas Electrical and Mechanical Institute, of which E. E. Rich is president; E. C. Luther, vice-president, and S. S. Cooper, secretary. Committees functioned under the folllowing chairmen: executive, William Beury; publicity, W. E. E. Koepler; entertainment, J. C. Smith; floor, S. N. Worley; golf, P. D. Woods; hotel reservation, Cliff W. Sykes; reception, E. E. Rich; papers and discussion, James M. Godwin; gadget, Harry W. Payne; general, John J. Lincoln; pioneers club, H. C. Calloway; safety clothing, F. J. Bailey; and program, C. C. Campbell.

Listed in the official program were the following exhibitors:

American Armature & Engineering Co.
American Gas & Electric Co.
American Brattice Cloth Corporation.
American Steel & Wire Co.
American Mine Door Co.
Albertson & Co.
Appalachian Electric Power Co.
Ashland Oil & Refining Co.
American Crucible Products Co.
American Car and Foundry Co.
Bluefield Hardware Co.
Bluefield Supply Co.
Black & Decker Mfg. Co.
Bonney Forge & Tool Works.
Buchanan-Williamson Supply Co.
Beckley Machine & Electric Co.
Browning Manufacturing Co.
Brown-Fayro Co.
Bearing Service Co.
Banks Miller Supply Co.
Bausch & Lomb Optical Co.
Clyde J. Boeringer.
Boston Varnish Co.
Boston Woven Hose & Rubber Co.
Bird & Son.
Continental Paint & Varnish Co.
Carnegie-Illinois Steel Corporation.
Chicago Pneumatic Tool Co.
Cincinnati Steel Products Co.
Cross Engineering Co.
Charleston Electrical Supply Co.
Coal Age.
Colt's Patent Fire Arms Mfg. Co.
Cardox Corporation.

A. D. Cook, Inc.
Coffing Hoist Co.
Chain Belt Co.

Diamond Chain & Mfg. Co.
Dayton Rubber Mfg. Co.
Joseph Dixon Crucible Co.
Duquesne Mine Supply Co.
Duff-Norton Manufacturing Co.

Electric Railway Improvement Co.
Electric Railway Equipment Co.
Economy Fuse & Mfg. Co.
Enterprise Wheel & Car Corporation.

Fostoria Pressed Steel Corporation.

John Flocker & Co.
Forest City Paint & Varnish Co.
Flood City Brass & Electric Co.
Fairbanks, Morse & Co.
Fafnir Bearing Co.

Goodman Manufacturing Co.
General Cable Corporation.
Goulds Pumps, Inc.
Guyan Machinery Co.
Gulf Oil Corporation.
General Electric Co.
Glidden Co.
Gibraltar Equipment & Mfg. Co.
Gates Rubber Co.

Huntington Supply & Equipment Co.
Heller Brothers.
Hardie Manufacturing Co.
Hendrick Manufacturing Co.

Ideal Commutator Dresser Co.
Industrial Bearing & Supply Co.
I-T-E Circuit Breaker Co.
Ingersoll Rand Co.

Johns-Manville Sales Corporation.
Joy Manufacturing Co.
Jeffrey Manufacturing Co.

Kanawha Manufacturing Co.

La-Del Conveyor & Mfg. Co.
Linde Air Products Co.
A. Leschen & Sons Rope Co.

McDowell Armature & Machine Works.
Mosebach Electric & Supply Co.
Mine Safety Appliances Co.
Mines Equipment Co.
F. E. Myers & Bro. Co.
Marathon Coal Bit Co.
Macwhyte Co.
Markham Products Co.
Metallizing Co. of America.
Mechanization.
Metal & Thermit Corporation.
McLaughlin Mfg. Co.
Manhattan Rubber Mfg. Co.
Miners' Gadgets and Inventions.

National Carbon Co.
National Tube Co.
Novo Engine Co.
National Electric Coil Co.
Norfolk & Western Railway Co.

Ohio Carbon Co.
O. P. Coal Burner Co.

Persinger Supply Co.
Portable Lamp & Equipment Co.
Peerless Pump Division.
Productive Equipment Co.
Post-Glover Electric Co.
Pennsylvania Crusher Co.
Princeton Foundry & Supply Co.
Pennsylvania Electric Coil Co.
Pocahontas Fuel Co., Inc.

Quaker Rubber Corporation.

Rockbestos Products Corporation.
John A. Roebling's Sons Co.
Republic Steel Corporation.

Superior-Sterling Co.
Superior Carbon Co.
Standard Oil Co. of New Jersey.
Socony-Vacuum Oil Co.
Southern Oxygen Co.
Solvay Sales Corporation.
Simplex Wire & Cable Co.
Sun Oil Co.
Sullivan Machinery Co.
Square D Co.
Sherwin-Williams Co.

Tamping Bag Co.
Templeton, Kenly & Co.
W. O. & M. W. Talcott, Inc.
Timken Roller Bearing Co.

United American Metals Corporation.
U. S. Steel Corporation Subsidiaries.
U. S. Bureau of Mines.
Union Carbide & Carbon Corporation.

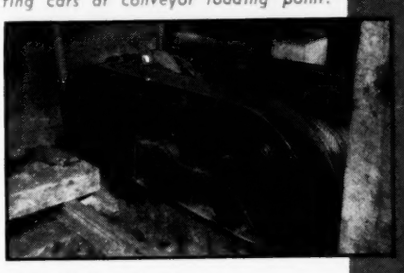
Van Dorn Electric Tool Co.
Virginia Polytechnic Institute.

Westinghouse Electric & Mfg. Co.
Williamson Supply Co.
Westinghouse Lamp Co.
Wheat Lamp Sales Co.
Wells Manufacturing Co.
West Virginia Rail Co.
West Virginia Armature Co.
West Virginia Geological Survey.
West Virginia University.

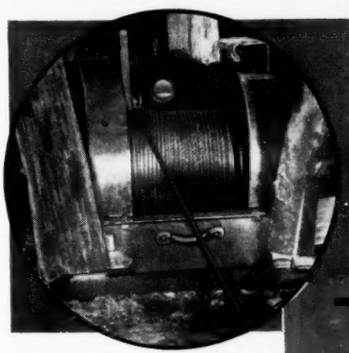
Yale & Towne Mfg. Co.

BROWN-FAYRO HOISTS
ARE USED ALMOST UNIVERSALLY IN THE MINES OF THIS DISTRICT!

At the Camel Run Mine . . . Model HKC Hoist spotting cars at conveyor loading point.



BROWNIE HKD Hoist at Powhatan Mining Company.



The Y & O's Dorothy Mine has an HKD serving their conveyors.

● It goes without saying that quality, efficiency and ability to do the job result in a product's acceptance . . . and in the No. 8 Seam it's Brown-Fayro for car spotting hoists.

Here, in these modern, up-to-the-minute mines, BROWNIE hoists are doing more than their share in providing operating efficiency. Shown here are a few of the many applications of car spotting hoists doing a job for operators in this district . . . *a cost-reducing job that can be duplicated in your mine, under your conditions.*

And, it's not only BROWNIE for all types of hoists, but for pumps, portable auxiliary blowers, retarders, rerailers, mine cars and wheels, too! Our sales engineers will be glad to recommend product applications best suited for you . . . call them in with no obligation!

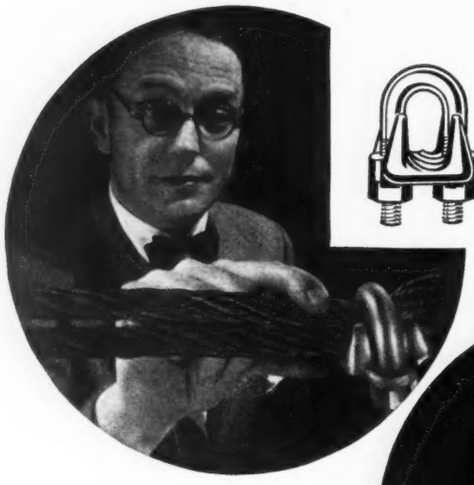
●

SEE BROWN-FAYRO FOR:

HOISTS	OIL SPRAY SYSTEMS
PUMPS	MINE CARS AND WHEELS
RERAILERS	SHEAVES
BLOWERS	
RETARDERS	

THE BROWN-FAYRO COMPANY
JOHNSTOWN, PENNA.

How Would You Grip Wire Rope?



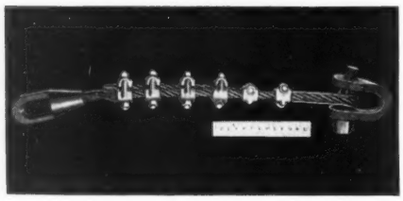
FINGER PINCH...?

Cuthbert can't do any better. The U-Bolt Clip he uses crimps and spoils the rope, causes delays and dangerous accidents. Would you hire Cuthbert to do a man-sized job?

OR FIST GRIP...!

"Here's the way to grip wire rope," says the Man On The Job. With a real fist grip! No delays, spoiled rope or accidents! It costs less to use Laughlin Safety Clips!"

CLIPS HOLD AT 88 TONS LOAD



Dramatic, competitive tests. A world-famous laboratory, a U. S. Government arsenal, and a leading wire-rope manufacturer tested the Laughlin drop-forged Safety Clip. They found it twice as strong —delivering over 95% of rope strength. An assembly of six Safety Clips held 88 tons load! Result: *fewer clips needed.*

THIS FREE FOLDER DESCRIBES THE TESTS

and proves money-saving features like these

SAVES TIME Bolts on opposite sides. Can't be put on backwards. Easy to apply, tighten and remove. Fewer delays from rope breaks.

SAVES ROPE Flat bearing surfaces grab strands and stay put without unlaying them.

WRITE US TODAY USING THIS COUPON

THE THOMAS LAUGHLIN CO.
PORTLAND, MAINE

Please send me free Safety Clip booklet, A-7

NAME .....

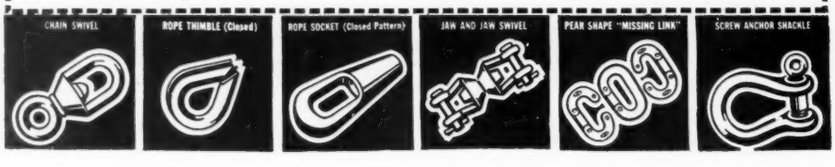
COMPANY .....

ADDRESS .....

CHECK HERE FOR CATALOG ON ITEMS BELOW

☐

Look for Laughlin products in The Coal Mining Catalogs and buy through your distributor.



Personal Notes

CHARLES L. BRANSFORD, who has been connected with the Republic Steel Corporation in the Birmingham and Gadsden (Ala.) districts in various administrative capacities for the last 12 years—as manager of the Birmingham properties since Jan. 1, 1938—has retired from active service with the company.

ALBERT J. BROWNING, Chicago, has been appointed as a special assistant to handle various problems in connection with the SPAB program, according to an announcement by Donald M. Nelson, executive director of the Supply Priorities and Allocations Board. Mr. Browning was deputy director of the Division of Purchases, Office of Production Management, from the time OPM was set up until last April. Previously he had served under Mr. Nelson in the National Defense Advisory Commission.

V. A. CURRY, formerly chief electrician and master mechanic at the Dehue (W. Va.) mine of the Youngstown Mines Corporation, has been promoted to superintendent of that mine, vice E. B. Agee, promoted to general superintendent of the Buckeye Coal Co., Nemacolin, Pa.

A. G. DELANEY, formerly assistant district manager for the Republic Steel Corporation at Gadsden, Ala., has been made general superintendent of operations there.

PRESTON DOCTORMAN has accepted a position as engineer at the Burning Star mine of the Truax-Traer Coal Co., Elkville, Ill. He was formerly a member of the engineering department of the Bell & Zoller Coal & Mining Co.

EDWARD I. EVANS, who has been manager for several years of the Gulfsteel district, Gadsden, Ala., of the Republic Steel Corporation, has been named manager of the southern district, including furnaces and steel operations at Gadsden and blast furnaces, coking plant and coal and ore mines in the Birmingham area. He succeeds C. L. Bransford, retired.

THOMAS GETTINGS, whose work in the Willow Grove mine disaster of March 16, 1940, was instrumental in saving many lives, has been named safety director by the Hanna Coal Co., St. Clairsville, Ohio.

MICHAEL GIROD has been appointed superintendent of the H. C. Frick Coke Co.'s Leisenring group of mines, located about 6 miles north of Uniontown, Pa. The three mines are to be reopened after being closed 15 years.

J. J. HUEY, of Canton, Ill., has been appointed electrical engineer for the United Electric Coal Cos., covering the operation of all its properties.

F. J. IMMLER has been appointed superintendent of the Labuce mine of the Alabama By-Products Corporation.

F. P. KERR, formerly superintendent of the Keystone (W. Va.) mine, Koppers Coal Co., has been appointed assistant general manager of the Eastern Coal Corporation, Stone, Ky.

J. S. KNOWLTON, of Chicago, has been appointed Deputy Director of Priorities in

charge of operations. He succeeds THOMAS B. MCCABE, who leaves the Priorities Division to take up new responsibilities on the staff of Lend-Lease Administrator Edward R. Stettinius, Jr. Mr. Knowlton is president and chairman of the board of directors of the Stewart-Warner Corporation.

L. S. LYON, Stonega Coke & Coal Co., has been promoted from general mine foreman to assistant superintendent at Rhoda, Va.

B. W. NORTON, formerly assistant district manager for the Republic Steel Corporation at Warren, Ohio, has been appointed general superintendent of mines and blast furnaces in the Southern district, Birmingham, Ala.

D. E. RENSHAW, mining section, industrial engineering department, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., has been reappointed a member of the committee on industrial power applications, American Institute of Electrical Engineers.

R. D. SAMPLES, formerly chief electrician, Stirrat No. 19 mine, West Virginia Coal & Coke Corporation, has been appointed chief electrician and master mechanic at the Dehue (W. Va.) mine of the Youngstown Mines Corporation, vice V. A. CURRY, promoted.

PHILIP WELTNER, Atlanta, Ga., has been named as assistant director of the price division, Office of Price Administration. Consultant to the Tennessee Valley Authority, he will handle organizational problems of the price division and will assume responsibility for directing its work in the lumber, building material and other important fields.

W. E. WHEELER, formerly senior inspector, Kentucky Department of Mines and Minerals, Pikeville, Ky., has been appointed safety inspector and employment agent of the Eastern Coal Corporation, Stone, Ky., vice W. A. EADES, resigned.

HUGH E. WHITE, West Frankfort, has been appointed vice president of District 12 (Illinois), United Mine Workers. He succeeds Fox C. Hughes, who resigned because of ill health. Mr. White has acted as secretary-treasurer of Subdistrict 9 of Franklin, Williamson and Saline counties and has served as board member of Subdistrict 7 three times.

•

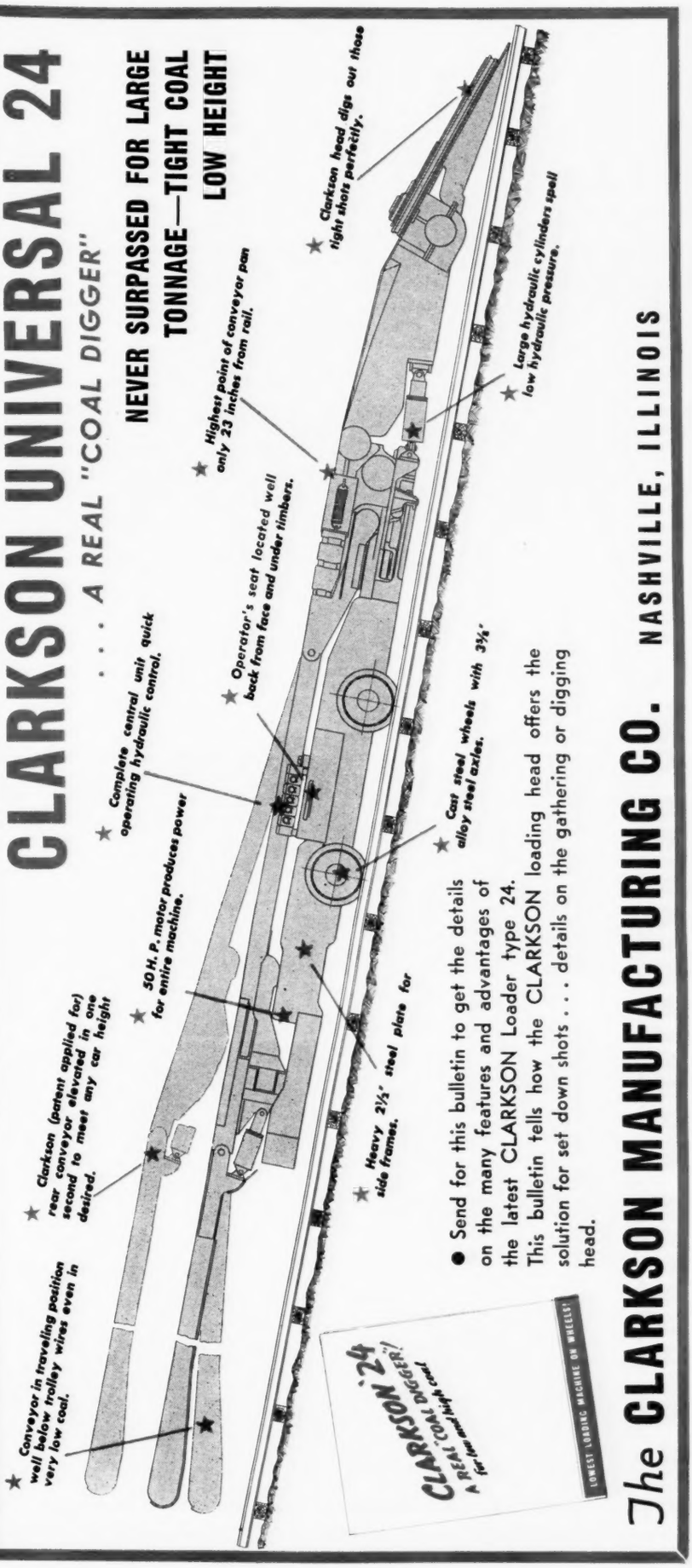
Ohio Mine Safety Law Goes Into Effect

A new measure designed to cut down coal mining hazards went into effect in Ohio Sept. 2. Passed at the last session of the Legislature, the act sets up more rigid safety requirements to keep step with advances in mechanization in the industry. The law limits the use of machinery in mines to certain types so designed that they will not emit electric sparks or flashes if used in gaseous or dusty mines. Furthermore, sufficient ventilation is required to provide for dilution of explosive mixtures. Other provisions limit explosives to types which can be fired only by experienced shotfirers.

CLARKSON UNIVERSAL 24

. . . A REAL "COAL DIGGER"

NEVER SURPASSED FOR LARGE TONNAGE—TIGHT COAL LOW HEIGHT


Clarkson head digs out those tight shots perfectly.
Highest point of conveyor pan only 23 inches from rail.
Operator's seat located well back from face and under timbers.
Large hydraulic cylinders spell low hydraulic pressure.
Complete central unit quick operating hydraulic control.
50 H. P. motor produces power for entire machine.
Clarkson (patent applied for) rear conveyor elevated in one second to meet any car height desired.
Conveyor in traveling position well below trolley wires even in very low coal.
Heavy 2½" steel plate for side frames.
Cast steel wheels with 3½" alloy steel axles.
CLARKSON 24 A REAL COAL DIGGER! For low and high coal
LOWEST LOADING MACHINE ON WHEELS!

• Send for this bulletin to get the details on the many features and advantages of the latest CLARKSON Loader type 24. This bulletin tells how the CLARKSON loading head offers the solution for set down shots . . . details on the gathering or digging head.

The CLARKSON MANUFACTURING CO. NASHVILLE, ILLINOIS

Thirty-Day Truce in Captive Mine Strike Effected by Mediation Board

A 30-DAY truce was effected Sept. 19 by the National Defense Mediation Board in the "union shop" dispute between the United Mine Workers and operators of captive mines in Pennsylvania, West Virginia and Kentucky under which the striking coal miners resumed on Sept. 22 "the production of coal indispensable to the national defense program." William H. Davis, Mediation Board chairman, arranged the settlement formula. The strike, which began Sept. 15, aimed to make union membership a condition of employment in steel company coal mines.

John L. Lewis, president, U.M.W., said that officials of the miners' organization agreed to the Mediation Board plan "only from a desire to make a contribution to the national interest." He added that the union "still dissents from the principle that strikes must be broken as the *quid pro quo* for consideration of a case on its merits" before the National Defense Mediation Board or any other government agency.

As outlined by Chairman Davis, the truce provides: "In order that the production of coal indispensable to the national defense program may proceed without interruption during the negotiations before the National Defense Mediation Board, the board most earnestly requests the parties to this controversy to make with the board the following agreement for resumption and continuation of production at the mines:

"That the United Mine Workers agree with the board that it will recommend the return to work of the men now on strike in such mines for a period of 30 days, and thereafter until the expiration of a three-day notice in writing given by the parties on either side.

"That both parties agree with the board to accept for said period the provisions of the Appalachian agreement.

"That the United Mine Workers agree with the board that during such period the provisions of the Appalachian agreement which require membership in the United Mine Workers as a condition of employment shall be inoperative.

"That during such period the board retains jurisdiction of the controversy and will continue with the parties collective bargaining negotiations in an endeavor to arrive at a mutually satisfactory agreement."

These recommendations were said by Mr. Lewis to be substantially the same as the offer made by his organization when the hearing began on Sept. 17.

Mr. Davis said that the board's recommendations were accepted without reservation by the captive mines but that James W. Carter, president of the Carter Coal Co., insisted upon certain other reservations which Mr. Lewis granted.

The union leader admitted that he had served formal notice on all Appalachian operators that it might be necessary to extend the strike to include them if the captive mines persisted in refusing to grant a union shop. He informed them that the international union reserved "the right to call and maintain strikes throughout the entire area covered by this agreement when necessary to preserve and maintain the integrity and competitive parity of this agreement." He added that he "still hoped that it would not be necessary now or later to extend the strike to all mines in the Appalachian area," but the union was taking the necessary formalities.

When the temporary settlement in the captive mine dispute was reached, Mr. Davis conferred with union representatives and Alabama operators in an effort to settle a controversy over the prolonged negotiations for a new wage contract based on the Appalachian agreement. The Alabama miners struck on Sept. 2 for ratification of the 40c. daily wage increase, vacation with pay, and elimination of the "reject" clause. The men returned to work early in the second week of September, leaving the grievance in the hands of the Board.

A walk-out which began Sept. 8 at mines in District 7 of the Pennsylvania anthracite field in protest against increased union dues and assessments steadily gained headway despite orders by union officials that the men return to work. The men in revolt demanded that the union rescind boosts in dues from $1 to $1.50 a month and in national assessments from $2 to $6 a year. The Anthracite Board of Conciliation demanded on Sept. 19 that the insurgents return to their jobs and submit their grievance through the proper channel for an orderly settlement.

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Crucible Mine Leads Over 50 First-Aid Teams In Pennsylvania State Safety Meet

WITH OVER 50 teams participating, including seven from the anthracite region, the fifth annual Pennsylvania State safety day and first-aid contest was held Sept. 6 at the Cambria County fair grounds, Ebensburg, Pa. The meet was sponsored by Richard Maize, secretary, and the bituminous and anthracite divisions of the Pennsylvania Department of Mines; the Joseph A. Holmes Safety Association, the United Mine Workers, Pennsylvania coal-mine operators and the U. S. Bureau of Mines.

The general committee included W. Garfield Thomas, deputy secretary, bituminous division, Pennsylvania Department of Mines (director of the meet); William Lamont, State mine inspector (assistant director); J. J. Forbes, chief federal mine inspector (chief judge); and Francis Feehan, mine safety commissioner, U. S. Bureau of Mines (announcer), with James R. Sanner, Ebensburg Coal Co., as secretary, and Bart C. Leonard, Adams Fuel Corporation, as treasurer. Other committees were headed by Mr. Leonard; R. B. Auld, Johnstown Coal & Coke Corporation; Ira P. Bradley, C. A. Hughes & Co.; R. D. Joseph, William B. Wardrop, George J. Steinheiser and Dennis J. Keenan, State mine inspectors; and Dr. A. L. Murray, G. W. Grove, and H. R. Burdelsky, U. S. Bureau of Mines.

First honors in the first-aid contest went to the Crucible mine, Crucible Fuel Co., with a score of 99.73. This team, which placed first also in the Uniontown (Pa.) sectional meet, was composed of Anthony Morascini (captain), Thomas Whalen Jr., John Torok Jr., Robert Whalen, Mike Biskup, John Matyk and Grazie Torok (alternate). The team was trained by Charles Opperman. Team awards included a plaque donated by the Mine Safety Appliances Co. and a silver cup by the Cambria County Fair Association, with $45 in cash to each member.

Second place ($35 per man) went to Vesta

Wide World Photo

Representatives of industry and labor confer with National Defense Mediation Board in effort to end amicably a strike of captive mine workers. Left to right, seated: Harry M. Moses, president, H. C. Frick Coke Co.; William H. Davis, chairman, Mediation Board, and John L. Lewis, president, United Mine Workers. Standing: Walter Teagle, employer member of the Mediation Board, and Hugh Lyons, representing employees on the Mediation Board.

W. H. Patterson, president, Johnstown Chamber of Commerce, sponsors of Black Diamond Week, with the King and Queen of Coal.

Best team in the first-aid contest, representing Crucible mine, with T. P. Latta, general superintendent; W. E. Hart, safety director; Charles Opperman, trainer; Richard Maize, secretary, Pennsylvania Department of Mines; W. Garfield Thomas, bituminous deputy secretary; and J. V. McKenna, 13th district inspector.

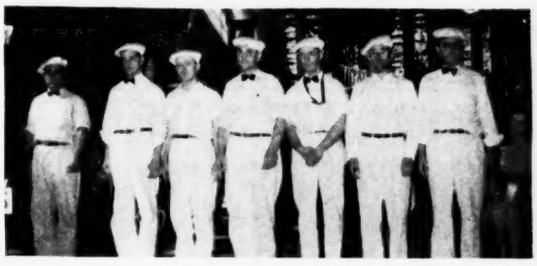
Second, Vesta Coal Co. No. 5 team.

Third, Colver team, Ebensburg Coal Co.

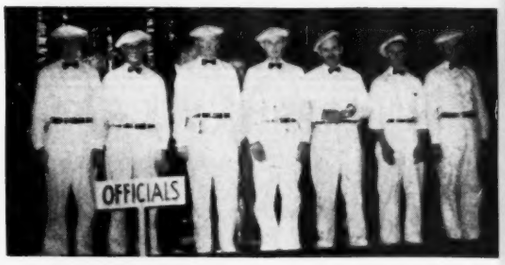
Harvey Yonkers, United Mine Workers

Martin Brennan, United Mine Workers

Fourth, Harwick team, Duquesne Light Co.

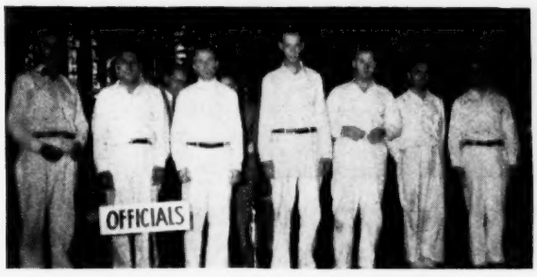


Fifth, Mine No. 123 team, Consolidation Coal Co.

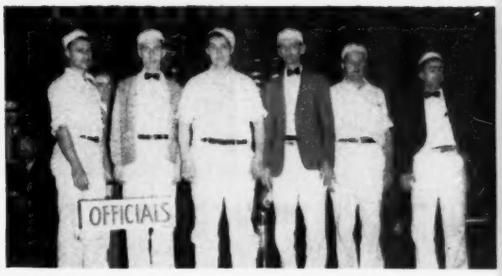


PENNSYLVANIA SAFETY MEET

King and Queen of Coal with representatives Mine Safety Appliances Co.



Sixth, Alaska colliery team, Philadelphia & Reading Coal & Iron Co.

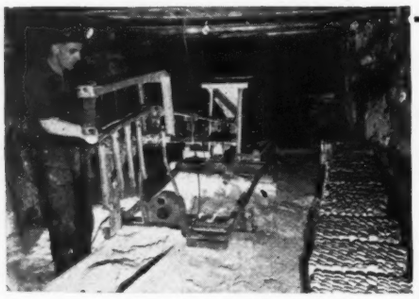


Seventh, Team No. 2, Mine No. 5, Pennsylvania Electric Co.

Anthracite inspectors and United Mine Workers representatives.

Bituminous inspectors and United Mine Workers representatives.

SEAL-TITE TAMPING BAGS *used at* DOROTHY MINE . . .



A safer, faster, cheaper method of sealing shots

The Pittsburgh No. 8 district of Eastern Ohio adds another to the important mining centers that use SEAL-TITE TAMPING BAGS. The picture taken at Dorothy Mine of the Y and O Coal Company shows rock dust being loaded into SEAL-TITE TAMPING BAGS. Properly tamped holes will cut powder costs and help your blasting crew in bringing down-falls. The largest mining companies in United States and throughout the world use SEAL-TITE TAMPING BAGS with great success. They are available in 65 different stock sizes for all needs. Fast shipment can be made to you from our large stocks. Write for free samples.

400 to 600 bags an hour packed with "THE DUMMY MAKER"

This efficient machine (shown in picture above) pays for itself quickly—no complicated machinery—easy to use—dependable—steps up working efficiency—saves time and costly skilled labor—ruggedly built to withstand constant use—uses clay or sand for stemming material—mounted on trucks for portability—operates on ¼ h.p. motor.

"The Dummy Maker" and 2 helpers can pack 400 to 600 bags an hour.

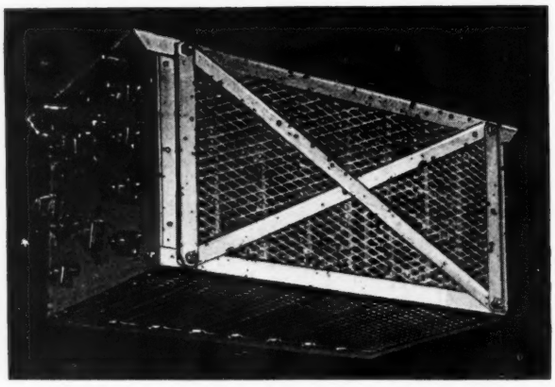
THE TAMPING BAG COMPANY
MT. VERNON, ILL.

SEAL-TITE KRAFT 100%

Our guarantee of Satisfaction

WRITE OR ASK FOR FREE SAMPLES

RESISTANCE THAT STANDS THE GAFF



REDUCE LOST TIME ON MINE LOCOMOTIVES

Have you ever stopped to consider just how much it costs you when a mine locomotive breaks down? Not only the cost of repairs but interruptions of service and loss of production while it is down.

Many of these locomotive failures are caused by trouble in the resistance. You can eliminate much of this trouble by installing G.M.C. RESISTANCE.

8 out of 10
Of the ten pit mines featured in this issue eight are using
G. M. C. RESISTANCE

WRITE TO US FOR DETAILS AND PRICES
OHIO MINES CALL PELLISH & CO., WHEELING, W. VA.

GUYAN MACHINERY COMPANY
LOGAN, WEST VIRGINIA

No. 5 team, Vesta Coal Co., comprising Claude Profitt (captain), John Shomock, John Fallecker, John Radachy, Mike Rudaii, Dennis Darney and Paul Tarr (alternate). Third honors ($25 per man) were taken by the Ebensburg Coal Co. team, made up of Frank Erhart (captain), Guy White, George Berkosky, Andy Secara, Frank Datsko, Warren Funk and Donald Craft (alternate). Fourth among the bituminous teams was Harwick mine, Duquesne Light Co.; fifth, Mine No. 123, Consolidated Coal Co.; seventh, No. 5 mine, Pennsylvania Electric Co.

Sixth place was taken by an anthracite team representing Alaska colliery, Philadelphia & Reading Coal & Iron Co. Members were: Patrick Kane (captain), Michael Raskie, Robert Parry, Edward Kramer, Leroy Dietrick, John Owens and Russell Harner (alternate). Other anthracite teams represented the Pompey Coal Co.; De Angelis Coal Co., Inc.; Colonial Collieries Corporation; Maple Hill colliery, Philadelphia & Reading Coal & Iron Co.; Jermyn-Green Coal Co.; Pine Ridge Colliery, Hudson Coal Co.; and the Penn Anthracite Collieries Co.

Presentation of the awards was preceded by short addresses by J. William Wetter, president, Rockhill Coal Co.; George A. Roos, general manager, Philadelphia & Reading Coal & Iron Co.; Harvey Yonkers and Martin F. Brennan, United Mine Workers; Mr. Maize; and W. H. Patterson, president, Johnstown (Pa.) Chamber of Commerce, sponsors of "Black Diamond Week," held this year Aug. 18-23. Lending their graciousness to the proceedings were the "King and Queen of Coal," otherwise Emil S. Bolha, Johnstown, and Miss LaRue Bathurst, daughter of Charles Bathurst, motor boss, Revloc mine, Monroe Coal Mining Co., who were crowned during Black Diamond Week.

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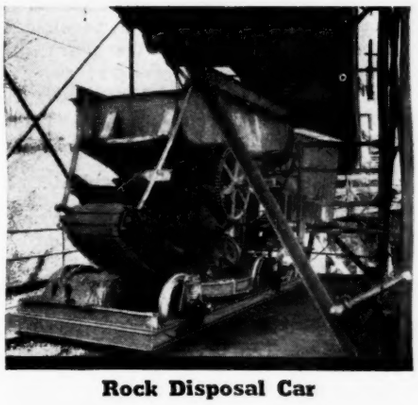
Stresses Importance of Crushing In Coal Preparation

The importance of crushing in coal preparation and the equipment used was emphasized by Joseph Teipel, chief engineer, American Pulverizer Co., in addressing the 1941–42 opening meeting of the Illinois Society of Coal Preparation Engineers and Chemists, held Sept. 19 at the Lymar Hotel, Herrin, Ill.

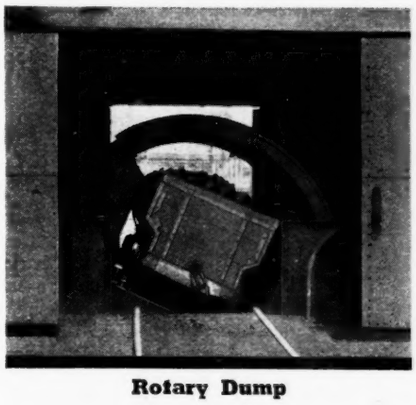
"The prime factor in the generation of power," said Mr. Teipel, "is coal—not water. Depending on the coal and conditions, we now produce power with 1.8 to 2.3 lb. of coal per kilowatt-hour. Preparation of the coal should be at the mine rather than at the power station; smoke laws must be met. Preparation engineers must prepare to meet all the problems that arise in the burning of coal."

All problems, however, are not met by preparation alone. Blending is one of the means of obtaining a satisfactory steam coal, he pointed out, and added that this is being tried out by the management of a power company in two Illinois plants.

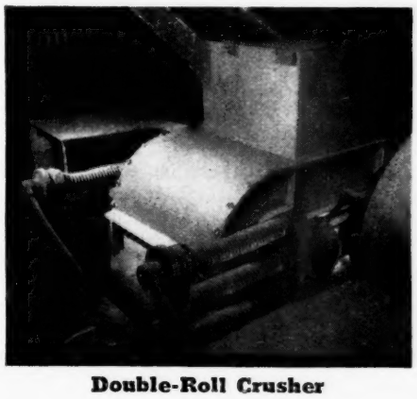
A coal crusher, to be satisfactory, must combine the following characteristics, said the speaker: (a) reliability, while taking care of any size of coal or refuse; (b) make the desired size with a minimum of degradation; (c) economy; (d) accessibility; (e)



Rock Disposal Car



Rotary Dump



Double-Roll Crusher

Coal Preparation Plants

Engineered by

Heyl & Patterson

Tipple and tipple equipment of the United States Coal Company shown here are typical of Heyl & Patterson installations throughout the Eastern Ohio No. 8 field.

- For more than 50 years Heyl & Patterson has designed and produced almost every kind of equipment for the preparation and handling of coal.
- Within its own organization, Heyl & Patterson has the engineering, shop and erection facilities to handle the complete job.

With the increasing demand for coal, mechanized mining is going forward with leaps and bounds. New modern tipples with specialized equipment will be needed to keep step with increased production.

Consult Heyl & Patterson engineers on your requirements for Model-Mine tipples and preparation equipment.

DESIGN • FABRICATION • ERECTION

TIPPLES, SCREENING and CLEANING PLANTS
ROTARY DUMPS - CRUSHERS - CONVEYORS
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HEYL & PATTERSON INC.

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reasonable cost: the important point is cost per ton of product rather than first cost of the crusher; (f) ease in changing size of product.

Three types of crushers described were: the breaker, for reducing to 2-in., particularly for hard coal; the roll, and the centrifugal. The single-roll type is adapted to reducing mine-run to 6- or 8-in.; the double-roll for reduction to 2- or 1½-in. Because of the spring mounting of rollers, the size of the product cannot be definite except in one dimension.

The centrifugal type has three variations: the swing hammer, the ring, and the ball mill, "which is expensive in upkeep." The swing hammer is utilized for feed or stone, and is O. K. for pulverized fuel. Its use in pulverized-fuel plants is two to one compared with ball mills. The ring crusher, originated 35 years ago, is popular with coal mines and power plants. It crushes uniformly and economically; former opponents of them now build them.

There is a more or less definite relation of CO_2 to the size of coal, said Mr. Teipel. By crushing coal to the proper size, higher CO_2 content may be maintained in the flue gases; in proof, the speaker submitted test results giving the size analyses of coals which indicated that crushed coals having a larger percentage of fines resulted in higher CO_2, less carbon loss to the ashpit and better over-all boiler efficiency. All this merely as the result of better crushing.

Another crusher accomplishment of record was the salvaging of 57 per cent stoker-sized coal from refuse.

Not only is the type of crusher important but proper installation is necessary to obtain satisfactory results. Among required conditions are: (a) uniform feed—not easily obtainable, for example, with frozen coal; (b) a discharge chute that will remove the sized material as produced; (c) an arrangement of the discharge chute that does not separate the coarse from the fine coal but lets it flow in its natural proportions.

Hearing on Bituminous Price Ceiling Under Way; Code Violations Considered

A CEILING on bituminous coal prices is sought at this time, Luther Harr, Bituminous Coal Consumers' Counsel, testified Sept. 9 because a "timely application of wise economic controls" can avert runaway prices such as marked the corresponding period in the first World War. Dr. Harr was the first witness in the hearing before Chief Examiner C. Rollin Larrabee at Washington, D. C., on the Harr petition to the Bituminous Coal Division to fix a ceiling on bituminous coal at average levels approximately 20 per cent above the present established costs in effect within the 22 coal-producing districts.

In his petition, Dr. Harr stated that his office had received many complaints of "profiteering" in the price of coal. These complaints came from widely scattered areas and indicated the need for general maximum prices. Increases of as much as $1.20 per ton have been reported. Dr. Harr pointed out that consumers are being urged to buy and stock coal now as an aid to the national defense program, both by his office and by various defense agencies. Consumers have responded patriotically to the appeal, and it is only fair that they be protected against being exploited for their patriotism.

The Bituminous Coal Division has denied a petition filed by District 4 Producers' Board, Cleveland, Ohio, requesting elimination of the differential for "crushed coal" produced in Ohio, or, as an alternative, establishment of a differential for such coal produced in other districts, in the minimum price schedules covering shipments into certain market areas in which Ohio coals are sold. The Division's order also denied a request by the Board for District 6, Wheeling, W. Va., which, as an intervener in the case, had asked elimination of the differential for the Ohio coals, providing a similar differential for coals produced in the Northern West Virginia Panhandle also were eliminated.

The Coal Division has issued an order denying a petition filed by District 4 Board which requested certain changes in regulations pertaining to seasonal discounts which code member producers in Ohio may allow from minimum prices in the sale of coal to retail dealers.

The Division has issued orders reinstating the registrations of the Wyatt Coal Sales Co., Charleston, W. Va., and the code membership of the Cole Fuel Co., Inc., a producer, London, Ky.

Director Howard A. Gray has announced that steps will be taken by the Coal Division to remove all ineligible persons from the list of distributors registered by the Division as eligible to purchase coal at a discount from minimum prices. The Division now is studying reports which it has required all registered distributors to file which show details of the distributors' purchases and resales of coal from Oct. 1, 1940, the date minimum prices became effective, to June 1, 1941.

Code Memberships Revoked

The Division has issued orders revoking the code membership of the Twin Elm Coal Co. and the Fancy Lump Coal Co., producers, of Bussey, Iowa, upon finding that the producers had wilfully violated the Bituminous Coal Act and regulations. The Division found that the Twin Elm Coal Co. had sold coal below the effective minimum prices, and the revocation order provided that it must pay $148.59 in taxes under the coal act as a condition of having its code membership restored. It was found that the Fancy Lump Coal Co. sold coal at less than the minimum price, and also granted the distributor an additional allowance which resulted in a further reduction below the minimum price. The revocation order provided that the producer must pay $1,290.62 in taxes as a condition of having its code membership restored.

An order has been issued by the Coal Division denying a petition filed by District 9 Board, Madisonville, Ky., which asked that minimum prices at the mine be changed so as to permit the sale of West Kentucky Ninth Vein coals in Market Area 34 (Evansville, Ind., and environs) at delivered prices on a parity with delivered prices for Indiana Fifth Vein coals. The west Kentucky coals are delivered in the Evansville market at minimum prices from 20 to 40c per ton higher than the Indiana coals, under the minimum prices now in effect.

The code membership of J. L. Witherspoon, a producer, Knoxville, Tenn., was revoked for wilful violation of the Coal Act and regulations. The producer was required by the order to pay $163.80 in taxes under the Coal Act as a condition of having his code membership restored.

Trial Examiner W. A. Shipman has filed a report recommending that the Division find that the Coryell Coal Co. (Frank Coryell), Hayden, Colo., has wilfully violated the Coal Act and regulations by selling coal below minimum prices, and that

Attendants at meeting of Illinois Society of Coal Preparation Engineers and Chemists.

Standing, left to right: F. Earle Swan, Chicago, Wilmington & Franklin Coal Co.; P. W. F. J. Moran, Pyramid Coal Corporation; W. H. Shutt, C. W. & F.; Howard Steelgrede, C. W. & F.; Raymond Bridges, Southwestern Illinois Coal Corporation; J. A. Bottomly, Sahara Coal Co.; Lee Hazen (president), Bell & Zoller Coal & Mining Co.; E. E. Gammeter, B. & Z.; Fred Miller, Franklin County Coal Co.; J. W. MacDonald, Old Ben Coal Corporation. Seated: Thomas L. Garwood, C. W. & F.; F. E. Dodge, Mid-Radiant Corporation; Ralph Prickett, Truax-Traer Coal Co.; C. C. Conway, Consolidated Coal Co.; Layton Brown, Franklin County Coal Co.; Carl E. Campbell (secretary), Shell Oil Co.

a cease and desist order be issued against him.

An order has been issued establishing a minimum price of $1.70 per ton at the mine for shipments of 1¼x0-in. unwashed coals from mines in the Oklahoma field of District 15 for use as locomotive fuel. The new minimum price applies to shipments from mines in Production Groups Nos. 10 and 11 of the district.

The Coal Division has issued an order requiring Upper Buchanan Smokeless Coals, Inc., a regional marketing agency, to appear at a hearing and show cause why regulations governing its activities should not be tightened and machinery set up for the establishment of maximum prices for its coals when found necessary for the protection of the consuming public. The agency's members' mines are located in western Virginia. The hearing will be held on Oct. 21 before Trial Examiner Joseph D. Dermody at Washington, D. C. The Division has also issued another order granting interim renewal to the agency's application for provisional approval as a marketing agency.

An order has been issued denying a petition filed by District 8 Board, Cincinnati, Ohio, requesting establishment of seasonal discounts for summer shipments of certain sizes of coals by motor trucks from mines in the district, which embraces southern West Virginia, eastern Kentucky, western Virginia and northeastern Tennessee.

Orders have been issued reinstating the code memberships of the Clear Branch Mining Co., Ligon, Ky.; Kenmont Coal Co., Jeff, Ky.; and Beaver Coal Mining Co., Drift, Ky..

Orders have been issued dismissing compliance proceedings against Charles Dalgetty, Nodaway, Iowa, and Leo Haywood, Mendota, Mo. The code membership of C. E. Houghton, of near Hamilton, Iowa, was cancelled upon the Division's finding that the producer wilfully violated the Coal Act and regulations by selling coal at delivered prices less than the effective minimum prices for delivered shipments. The Division further found that the producer must pay $119.27 in taxes under the Coal Act as a condition of having his code membership restored.

Cease and desist orders were issued against the following producers, restraining them from further violations under the Coal Act and regulations: Francis C. Bozwick, doing business as the Hillside Coal Co., Mystic, Iowa; Virgil Browne, Quality Coal Co., Centerville, Iowa; Right Way Coal Co., near Chariton, Iowa; Sherman Guy, Ed Sprain and Bob Hunley, La Follette, Tenn., and McHenry Brothers Coal Co., Livonia, Mo.; Stone Mining Co., Inc., Evansville, Ind.; J. E. Gorham, Moberly, Mo.; Emil F. Fernetti and John Amershek, trading as Blue Ridge Coal Co., Garland, Kan.; and Ellis Blackburn, Huddy, Ky.

•

Frick to Reopen Mines

Preparations are under way to resume operations at the Maxwell mine, La Belle, Pa., and the Leisenring group of mines, Leisenring, Pa., of the H. C. Frick Coke Co. Maxwell has been idle since 1937, when it employed 500 men, and the three Leisenring operations have been closed 15 years.

CONCENCO PRODUCTS

The SuperDuty Diagonal-Deck Coal Washing Table is so closely linked with new methods and new performance records in coal preparation, that many engineers credit it with creating a new horizon—if not symbolizing in itself the new horizon.

Unprecedented ever increasing field acceptance is proof of that extra capacity and greater washing efficiency available in the modern design and construction of SuperDuty tables and reflected in dollar-making performance per sq. ft. of floor space occupied.

In the last twelve months the outstanding new washer projects of national and international importance requiring washing tables, have selected — almost without exception — SuperDuty Diagonal-Deck equipment.

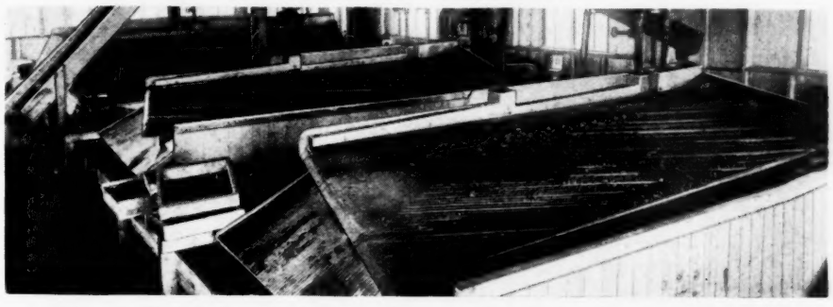
The record making Concenco Anti-Friction Bearing Head Motion on top of other far advanced design and construction features further enhances the acceptance of SuperDuty Diagonal-Deck equipment, mechanically, economically and in cleaning efficiencies at high capacities.

This heavy duty head motion has but one adjustment, readily made while in operation. Stroke and differential are coordinated to follow in correct relation at any setting for the most efficient deck action. The practical field value of this novel engineering feature is evidenced by the better cleaning results and higher tonnages of the table *in the hands of non-expert attendance.*

Tests have shown that these smoother and quieter SuperDuty tables require much less power to start and less power to run.

The SuperDuty is the most rugged, compact, dependable, mechanically simple, highly efficient concentrating table available to the coal industry today. In fact it is the only strictly new and modern table developed in recent years.

Coal Cleaning at Paris Coal Washery Company is handled by four SuperDuty Tables and two Leahy Screens.



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The Original Deister Company

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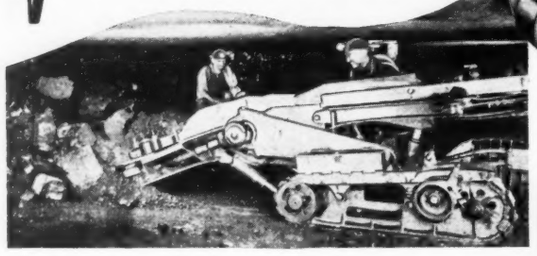
Spray Nozzles • Duplex Washing Tables • Leahy Screens • Constriction Plate Classifiers

GOOD REPORTS *on Bearing Service* **are the rule in Mines using AHLBERG ALL-BEARING SERVICE!**

A MAINSTAY of MECHANIZATION...

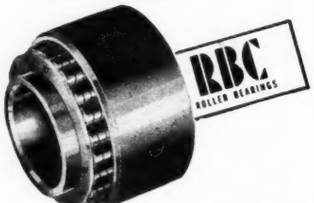
Ahlberg *All-Bearing Service*



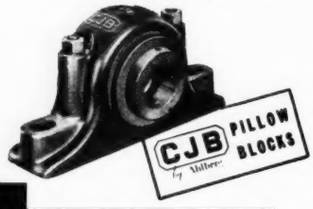
You save an extra 40% when you exchange sound worn ball bearings for these Ahlberg service-proven bearings which carry a new bearing guarantee.

Precision-manufactured by Ahlberg to even closer tolerences than S. A. E. Standards. Sizes and styles to meet every need.

Micro-Honing gives these roller bearings of supreme quality the greatest roller surface contact of any roller bearings made.



A complete line of straight and spiral roller bearings, machine tested at final inspection. R B C's are used as standard parts by National Equipment Builders.



Precision bearings in sturdy housings with generous lubricant reservoirs. Seals are large and long-wearing.

A MOST important item in the maintenance cost of modern mining machinery is bearing replacement, made necessary at relatively short intervals of operating time by the severe service the bearings undergo.

You can save time and money on these replacements by standardizing on Ahlberg All-Bearing Service. Using this dependable Service, you get reliable quality and prompt supply of all your bearing needs; you get every type, style and size of bearing from a single source. Your authorized Ahlberg Supply House is backed by complete stocks at 26 strategically located Ahlberg warehouses, where engineering assistance is also available.

Remember, you save an extra 40% when you exchange Your worn ball bearings for Ahlberg Ground Bearings.

Write for Bulletin M-1 and get acquainted with Ahlberg All - Bearing Service on your next replacement job.

The complete Ahlberg line includes:
NEEDLE BEARINGS
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PILLOW BLOCKS AND
TRANSMISSION UNITS

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Manufacturers of CJB Master Ball Bearings
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Large Steam Generators Planned By Kentucky Utility

Kentucky Utilities Co. is proceeding with plans for a new 25,000-kw. steam generator plant at Tyrone, Ky., on the Kentucky River. It also contemplates installation of foundations for a second unit of 25,000 kw., and subsequently two others of similar capacity. The plant will have facilities for using either river or rail coal, with crusher, hoppers, crane, etc.

•

Payroll Record Keeping Revised By Wage-Hour Division

Revision of the record-keeping regulations under which 350,000 employers must keep payroll and other records concerning more than 15,500,000 workers was announced Sept. 15 by General Philip B. Fleming, Administrator of the Wage and Hour Division, U. S. Department of Labor. They apply to all employers who have employees engaged in interstate commerce or in the production of goods for interstate commerce.

A new requirement is that "each employer shall . . . preserve for at least two years from the last date of entry the originals or true copy of any and all customer orders or invoices received, incoming or outgoing shipping or delivery records, as well as all bills of lading, and all billings to customers (other than 'cash') which the employer retains or makes in the course of his business or operations." Preservation of these records is required to enable Wage and Hour inspectors to determine if the act applies at any given time.

The revision of the regulations resulted from petitions filed by large employers. As the 40-hour work week is the unit of the Wage and Hour law, the Division's record-keeping regulations had required recording of total hours worked each day and each work week and total straight time compensation for each week. The requirement of a record of weekly earnings did not mean that the employer had to pay his employees each week. However, some large employers petitioned that recording of weekly as well as semi-monthly earnings would be a costly and an unnecessary addition to bookkeeping. As a result, employers paying on a semi-monthly basis may record daily instead of total weekly straight-time earnings. As to hours, daily and total weekly recording is still required by the regulations. Daily hours may be recorded by entering starting and stopping time.

Although executive, administrative, professional employees and outside salesmen are not within the wage and hour requirements of the law, the regulations require among other things that a record be kept of the total wages or salaries paid them each pay period and show the basis on which such wages or salaries are paid. Current regulations require only recording of the name, address, and occupation of such employees.

All additions to or deductions from cash wages for rent, company store purchases, etc., may be recorded on a pay period basis where they do not affect minimum

wage or overtime payments. Where they do affect cash payments of at least the minimum or overtime payments, they must be recorded on a weekly basis and employers must preserve "all records used . . . in determining the original cost, operating and maintenance cost, and depreciation and interest charges." Such records must be preserved two years.

Provision is made in the regulations to allow employers with special problems to keep their records otherwise in a manner satisfactory to the Administrator upon petition and receipt of authority from him.

•

Mead Tipple Burns

The tipple of the C. H. Mead Coal Co., Eastgulf, W. Va., was destroyed Sept. 24 by fire which Superintendent Harold W. Yates said was started by sparks from an electric welder. Nearly eight hundred miners were left idle by the blaze.

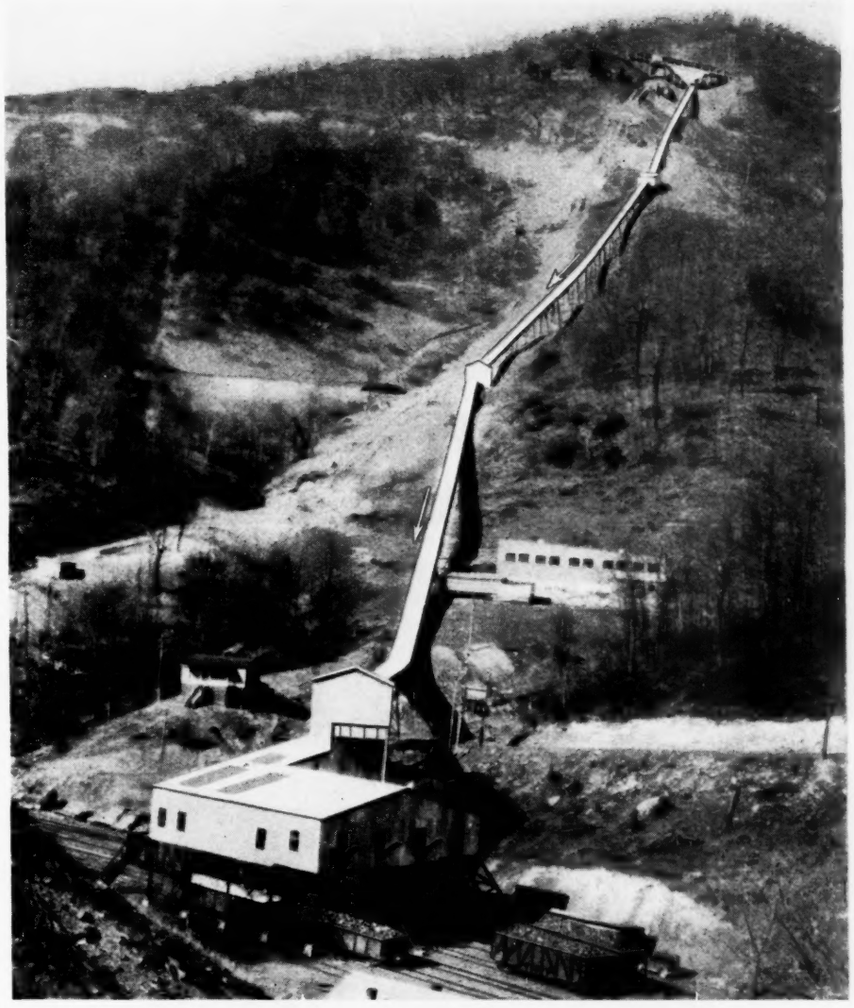
•

C. F. DeBardeleben Is Dead

Charles F. DeBardeleben, 65, president of the Alabama Fuel & Iron Co., died Aug. 31 in a Birmingham (Ala.) infirmary after a prolonged illness. Born at Prattville, Ala., Mr. DeBardeleben was educated at Alabama Polytechnic Institute, his first work being at a coking plant at Bessemer in 1892. Later he was connected with Pratt operations at Johns, Ala.; plants of the Tennessee Coal, Iron & Railroad Co. as assistant foreman, then mine foreman at the Belle Ellen mines of the Bessemer Coal, Iron & Land Co., after which he established the Little Cahaba Coal Co.

When the Alabama Fuel & Iron Co. was reorganized in 1908 he was made vice president, becoming president in 1921. He was keenly interested in the welfare of A.F.I. employees, supplying them during the depression with seed, tools, land and mules to cultivate gardens for the use of their families and feedstuffs for livestock, which enabled them to weather the slack period. He was proud of the fact that during this period it was not necessary for any of his em-

Charles F. DeBardeleben



6,000,000 TONS Carried by this Conveyor

OVER 6,000,000 tons of run-of-mine coal have been handled by this S-A Belt Conveyor over its 1,400-foot run at Blue Diamond Coal Company's Mayflower Mine at Bonny Blue, Virginia.

***It has moved this huge tonnage with a minimum of maintenance attention,* according to S. M. Williams, Superintendent . . . and has many more tons to go.**

Service records like these on S-A Conveyors all over the world are your best assurance of *low cost per ton* handling when you buy S-A equipment.

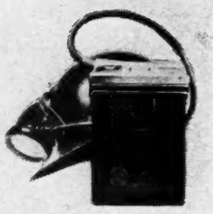
Stephens-Adamson Mfg. Co.

MAIN PLANT Aurora, Illinois
(2 Ridgeway Avenue)
WESTERN PLANT—Los Angeles, Calif.
CANADIAN PLANT—Belleville, Ont.

S-A CONVEYORS AND COAL CLEANERS

Thousands of

WHEAT for BETTER LIGHT

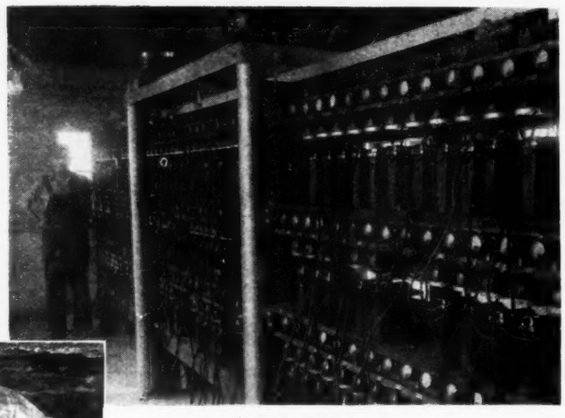


in Eastern Ohio No. 8 Field

AT U. S. COAL CO.→

800 WHEAT LAMPS

are in service. This view is in the Lamp House, where by a "twist of the wrist," the Wheat Lamp is put on, or taken off charge, with nothing to disconnect or open.



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more than 1500

Wheat Lamps help get out the daily average of 17,000 tons. The shooter has all the light he wants, all the time, from his Wheat Cap Lamp.

Also makers of the

KOEHLER FLAME SAFETY LAMP

Greater gauze area, for increased sensitivity. The most satisfactory service for the lowest operating and maintenance cost. The best in protection.

RUGGED—SENSITIVE BETTER VENTILATION

FOR MORE LIGHT WITH LESS WEIGHT

The Wheat has proved its superiority in every respect. The Wheat Battery weighs less, can't spill, maintains high voltage all through its discharge. The Wheat Lamp has its Krypton Bulb mounted so as to eliminate the "black spot"—also a spare bulb for emergency. There is a Wheat *Reflector* to give exactly the beam you want—wide, medium, or focussed "spot." Perfect balance of the headpiece eliminates "drag." Fully descriptive circular gives the details you want. Write for your copy today.

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SAFEST — LIGHTEST — BRIGHTEST

WHEAT CAP LAMP

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RUGGED - DEPENDABLE SENSITIVE

BETTER LIGHT - LESS WEIGHT NON-SPILLABLE

TWINS OF MODERN MINING

ployees to call for assistance from the federal government.

His father was a pioneer in the industrial growth of the Birmingham area, being interested in development of the first coke ovens there, the Pratt coal mines, the old Alice furnace, and the DeBardeleben Coal Corporation, of which his brother, Henry DeBardeleben, is now president. Three sons survive: Prince, vice president of the Alabama Fuel & Iron Co.; Charles F. Jr., president of the Red Diamond Mining Co., and Walker, secretary-treasurer of the Charles C. Steward Machine Co.

•

Smoke Abatement Manual Shows How to Keep Cities Clean

Correct methods of handling large and small heating installations to prevent the formation of smoke and fly-ash are contained in the 1941 Manual of Ordinances and Requirements recently issued by the Smoke Prevention Association of America, with headquarters in Chicago. In its textbook material, it includes an article by J. F. Barkley, supervising engineer, Fuel Economy Section, U. S. Bureau of Mines, on methods of reducing fly-ash emission and also instructions for direct hand-firing of bituminous coal in residence heating plants, apartment houses, etc., both well illustrated, also methods of operation of underfeed stokers as indorsed by the Stoker Manufacturers' Association. S.M.A. Uniform Stoker Rating Rules follow and the Proceedings of the 35th Annual Convention at Atlanta, Ga.

This book also contains a most useful compilation of answers to a questionnaire addressed to 75 cities and districts, which questionnaire included nearly 50 inquiries regarding coal, oil and gas used, their quantities, the departments and persons in control of combustion, employees in department, manner of controlling combustion, population of city, how smoke density is measured, restrictions in length of permissible period of smoke emission, fines, what furnaces are exempted, restrictions of solid-matter emission, pollution surveys, limitations of volatile matter in coal used, etc., with, finally, a bibliography on kindred subjects. Price, 60c.

•

Installs Larger Equipment

St. Ellen mine of the Perry Coal Co., O'Fallon, Ill., is adding larger cars and transfer stations to its gathering equipment. The cars are 7½x15 ft. and stand 40 in. above the rail. Length over bumpers is 16 ft. 7½ in. The transfer elevator was made by the Jeffrey Mfg. Co., the cars by Sanford-Day.

•

To Reopen Sayre Mine

Sayre mine, Jefferson County, Alabama, is to be rehabilitated and reopened by the Republic Steel Corporation in connection with construction of an 800-ton furnace and battery of 65 byproduct coke ovens at its Gulf division, Gadsden, Ala. The coal operation, which is on the Louisville & Nashville Ry. about 30 miles from Birmingham, has been idle ten years.

Chemists at Atlantic City Study Hydrogenation, Oxidation, Coking and Coal Analysis

WHAT makes coal hydrogenation click and why? Can the hydrogen for such a hydrogenation be provided by a hydrocarbon instead of by hydrogen gas? Is it gas pressure within a gas-tight coating that causes coal to swell during the formation of coke? Does coal oxidize less and less with the passage of time? Furthermore, how does oxidation change the plastic properties of coal as exhibited when the coal is being carbonized? And how does oxidation affect the character and quality of the decomposition products? These were some of the outstanding subjects mulled over in the Sept. 11 sessions of the Division of Gas and Fuel Chemistry at the 102d meeting of the American Chemical Society, held in Atlantic City, Sept. 8-12.

Other problems were: Is the chemical method of ascertaining the quantity of mineral charcoal (fusain) in coal going to displace the present system of laboriously selecting and counting under a microscope the myriad fusain particles in a mass of coal? How should difficult coals containing calcite and pyrite be analyzed? How can determinations of sulphur and of ash-softening and ash-flow temperatures be speeded? And how should the temperature be determined at which coals begin to burn without externally added heat?

How to Convert Coal Into Oil—The chief purpose of Bureau of Mines tests on coal hydrogenation is to determine the amount and quality of gasoline and other oil products which can be obtained from the various coals by chemical combination with hydrogen, declared H. H. Storch, supervising physical chemist, in presenting a paper by himself and C. O. Hawk and W. E. O'Neill, his assistants. These tests constitute a preparedness measure designed to provide information concerning the possible use of the coal hydrogenation process in anticipation of the day when America's petroleum reserves fail to meet the demand for liquid fuel. No one knows when this will occur, but it is well that the United States be prepared to evaluate the coal-hydrogenation processes. To obtain a more complete understanding of the chemistry of this process, research work has been done on the effect of the various factors, such as temperature, pressure, contact time and catalysts, on the degree of coal liquefaction, hydrogen absorption and oxygen removal from the coal.

The chief function of the catalyst was found to be the speeding up of the rate of regeneration of a "hydrogen carrier." This carrier is a hydroaromatic oil which readily yields its hydrogen to the coal substance. Thus, in the presence of an excess of such a hydrogen carrier, coal may be readily liquefied without any hydrogen gas. However, hydrogen gas at high pressure is essential to regenerate the carrier. These facts emphasize the importance of the "vehicle" (or oil in which the coal dust is suspended to form a paste that is pumped into the high-pressure reaction vessels). Apparently, one of the ways in which coal hydrogenation processes may be improved is to design a separate cycle for maximum efficiency of regeneration of the vehicle, rather than to combine this regeneration with the liquefaction step, as is now done in coal-hydrogenation procedures.

Illinois Coal Company Starts New 30-Yd. Electric Shovel

This 30-yd. electric shovel recently went into operation at Cuba (Ill.) strip mine of the United Electric Coal Cos. Two mill-type Westinghouse motors each with a nominal continuous rating of 250 hp., 230 volts, 410 r.p.m. operate the counterbalanced dipper hoist. Crowding is handled by a forced-ventilated mill-type motor with a nominal continuous rating of 125 hp., 230 volts and 475 r.p.m. Two similarly designed motors, but arranged for vertical mounting on top of the gear case, operate the swing motion. Supplying variable-voltage power is a motor-generator set composed of two 2250-kw. hoist generators, two 112.5-kw. swing generators, one 112.5-kw. crowd generator, and a 35-kw. 125-volt exciter all driven by a 1,000-hp. synchronous motor.

LeTOURNEAU CARRYALLS Move Culm Banks . . . Strip Underlying Coal

Years ago engineers abandoned the idea of recovering outcrop coal, near Mt. Carmel, Pennsylvania. Surface faults prevented conventional tunnel and shaft systems. Multiple equipment investment for shovel, dragline and trucks made recovery by stripping prohibitive. Since then, culm banks had been deposited over the coal area. Today the waste piles, *plus* the original overburden, are being removed at a profit with the modern LeTourneau mining method.

Here's How

Smart stripping contractors, Bridy-Hanlon are using two LeTourneau W Carryall Scrapers, pulled by "Caterpillar" D8 tractors—thus, have combined loading, hauling and dumping into one continuous cycle of low-cost operation. A third "Caterpillar" D8, with LeTourneau Angledozer is used as pusher, cuts Scraper loading time in tough, wet shale to help the extra-capacity Carryalls perform as follows:

Haul (round trip)	1800 feet
Load	1.0 min.
Spread	0.5 min.
Turns, gear shifts, etc.	1.2 min.
Travel over variable favorable grades up to 14%	6.3 min.
Total	9.0 min.

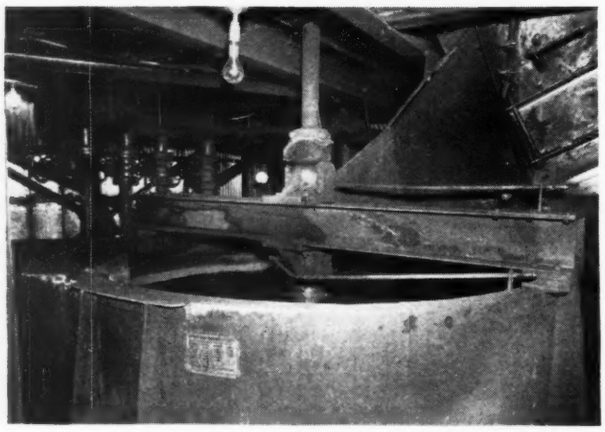
Trips per hour	6.67 (one unit)
Excav. Yds. per load	18
Excav. Yds. per hour	240 (both units)

Working two 7-hour shifts, that's a combined Carryall output of 3360 cubic yards, bank measure, stripped daily! Here is the low-cost answer to many another difficult coal stripping and reclamation problem. See your LeTourneau-"Caterpillar" dealer about this modern LeTourneau mining method . . . TODAY!

LETOURNEAU
PEORIA, ILLINOIS · STOCKTON, CALIFORNIA

GIVE MORE POWER TO YOUR COAL

. . . . Through Better Preparation



Illustrated is a view of a Chance Cone

● Properly cleaned coal delivers more power per ton burned, improves combustibility and is essential to the needs of modern combustion equipment.

The Chance Sand Flotation System offers the ultimate in the Wet process of coal cleaning. With more and more mechanically mined coal there is a steadily increasing demand for efficient cleaning systems. Here's one that will handle increased tonnages at low cost and improve the marketability of your coal.

Fairmont also provides a dry coal cleaning system of exceptional efficiency in the American Pneumatic Separator. For those plants more adaptable to a dry process investigate the American.

In either case, consult a Fairmont Engineer for an experienced analysis of your needs and suggestions on equipment that will most economically solve your cleaning problems — equipment that will through better preparation give more power to your coal.

TRADE MARK REGISTERED

FAIRMONT MACHINERY COMPANY

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New way to solve
ATHLETE'S FOOT
problem

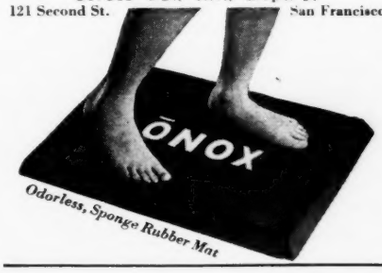
If you have shower rooms, your problem is ever present. Your employees are exposed to infection every day. Our problem is to convince you that ONOX is not "just another one of those Athlete's Foot remedies."

Recent research has upset former theories on prevention of Athlete's Foot. The new procedure is revolutionary—the ONOX method. A safe non-poisonous skin toughener does the work. Employees like it! You may test it under any conditions you choose to impose and without obligation. For example.

● *We will ship prepaid, your trial order for any amount of ONOX and equipment. Use it for 60 days. If at the end of that time ONOX has not proved itself to your complete satisfaction (100%) you owe us nothing and return nothing. This offer is open at any time to established industrials.*

We would like to send you the details of the simple ONOX method. Used by hundreds of industrials from Coast to Coast.

ŌNOX CO., Inc., Dept. N
121 Second St. San Francisco



COFFING ADVANCED DESIGN HOISTS
Ratchet Lever • Spur Gear • Electric
Load Binders • Trolleys • Differentials

. . . *Keep Maintenance and Repair Costs Down with*

COFFING'S
New
MODEL "Y-C"
BALL BEARING SPUR GEARED CHAIN HOISTS

Realize true economy by equipping your repair shops with these Model "YC" Hoists. They are of the conventional planetary spur gear type and will give years of trouble-free service. Built in six capacities ranging from ½ ton to 4 tons.

Write for Bulletin YC-1 giving complete information, specifications and prices.

COFFING HOIST CO. DANVILLE, ILL.

O. W. Rees
New Gas and Fuel Division chairman.

Splint Coal Makes Weaker Coke Than Bright Coal—Carbonization tests at 500 deg. C. in the Fischer retort show that, except for bright coals of high-oxygen content, the coke made from bright coal is much more swollen and cellular than that made from splint, asserted D. A. Reynolds, associate chemist, Central Experiment Station, U. S. Bureau of Mines, speaking for himself and J. D. Davis, supervising chemist. With one exception, agglutinating values determined by the Bureau have been lower for splint than for associated bright coal.

However, because the Bureau of Mines-American Gas Association (BM-AGA) test requires charges of not less than 85 to 200 lb. and because such a large quantity of coal cannot be sorted into bright, splint, or other coal without extremely tedious and time-consuming work, no studies have been made of the coking characteristics of the several types when coked alone. However, bed layers have been chosen that are composed largely of either splint or bright coals, and deductions accordingly may be drawn of the effect of the several constituents.

Coking Characteristics Due to Origin—In the course of its later tests, the Bureau was able to study four medium-volatile coals, one of which—the Lower Banner coal—was predominantly derived from the fallen material of the coal forest (attritus) and consisted largely of semi-splint and cannel. The Lower Banner had 36 per cent of bright coal, 53 per cent of semi-splint and 11 per cent of cannel. On the other hand, the Sewell bed coal had 81 per cent of bright woody coal and, in all, 19 per cent of coal that had an attrital origin. The other two coals, from the Bakerstown and the Lower Freeport beds, had 91 and 93 per cent respectively of bright coal.

All, on a dry mineral-matter-free base, had percentages of fixed carbon between 73.4 and 77.5. Hence, taking the chemical composition as a guide, much the same coke might be expected from all four coals. As marked differences are found, it is logical to ascribe these variations to the difference in the origin and in the consequent petrographic composition of the coals.

Coke, gas and tar yields from the Lower

ABC JUTE BRATTICE CLOTH

IT'S CHEMICALLY TREATED TO Resist FUNGI AND FLAME

★Tried and proved by actual test to stand up best under most severe conditions.

● Widely used, ABC Jute Brattice Cloth demonstrates its ability to dependably resist

(1) FUNGI—(the many types found in some mines) because of a compound which is formed by the chemicals used

(2) FLAME—the best-known flame resistant chemical treatment is given ABC jute so that this Brattice Cloth can be fully depended upon

In addition to these features ABC Jute Brattice Cloth will not shrink even in a very wet mine, thereby assuring full width at all times.

Leakage of air is kept at a minimum with ABC Jute because our cloth is woven from heavy yarns, loomed skillfully and uniformly throughout. With ABC Jute Brattice Cloth you may be sure of well ventilated working places.

American **BRATTICE CLOTH CORPORATION**
WARSAW, INDIANA
Agencies in all Mining Centers

Keep an accurate permanent record of every miner's car loadings - - -

DALY'S IMPROVED CHECKING SYSTEM

Cuts Costs - - Prevents Mistakes

Now check and control machine or hand loading with the only check that carries the miner's turn on cars—the only check that will eliminate the turn sheet.

This is the only check made up of special inks and paper tested for mine check use. The weighman is supplied with a receipt for every car dumped during the day. He can locate lost cars with ease. Cars can be located on the road from day to day. The Daly check will not slip or jerk off while car is being dumped. Daly checks are serving successfully in many of the country's largest coal mines.

SUPERIOR FOR CHECKING AND CONTROLLING MACHINE OR HAND LOADING

Write for details regarding our FREE trial offer.

DALY TICKET CO.

Established 1911 — **Collinsville, Illinois**

DEPENDABILITY

That one word—*dependability*—tells you all you need to know: all you want to know about

Ironite Mine Telephone Wire

Dependable — because of its strength — long spans hold up under unusual strains.
Dependable — because conductors do not corrode from sulphur vapors.
Dependable — because the 30% spec. rubber insulation is waterproof, cold proof and heat resisting.
Dependable — because mica-armored pitch-saturated braid resists friction and blows to an unusual degree.

And a mine telephone *must* be dependable above all else. Ask your supply house or direct for money saving quotations on Ironite Mine Telephone Wire.

PARAGON ELECTRIC CO., 405 S. Dearborn, Chicago

G. R. Yohe
Newly elected secretary of the Gas and Fuel Division.

Banner, which, as stated, is composed largely of splint and cannel, did not differ significantly from those of the other coals, but the coke from the Lower Banner had the highest apparent specific gravity and was the weakest under both shatter and tumbler tests. The agglutinating value, which affords some indication of the coking property, is lowest in the Lower Banner, and this value bears roughly the same relation to similar values in the other coals as exists between its 1-in. tumbler-test index and the 1-in. tumbler-test index of the other coals.

Splint Coal Liquefies Excessively Before Coking—By the Gieseler plastometer test, the maximum fluidity of the Lower Banner coal is much higher than that of the coals with which it is being compared, the values being: Lower Banner, 290; Sewell, 89; Bakerstown, 84; Lower Freeport, 36. Lower Banner coal developed maximum internal gas pressures of 0.2 and 0.1 lb. per square inch at 600 deg. C. and 900 deg. C. respectively, compared with 25 to 43 lb. at 600 deg. C. and 5 to 11 lb. at 900 deg. C. for the other coals, all of which indicates that gas and vapors escape from the plastic Lower Banner coal much more easily than from the other coals.

Splint Coal Contracts When Coking—In the sole-heated oven, at a charge density of 55.5 lb. per cubic foot, with the heated wall, or sole, kept at 950 deg. C. and with the coal under a constant pressure of 2.2 lb. per square inch, the Lower Banner coal *contracted* 6.2 per cent, whereas the other coals *expanded* 9.8 to 19.0 per cent. Yet the Lower Banner had a fixed-carbon percentage that places it safely among coals that may be expected to expand during carbonization.

High fluidity apparently permits gases and vapors to escape easily from the plastic layer, and so the charge does not expand, and no significant pressures develop. High-volatile coals, in the Gieseler test, have this high fluidity, and C. C. Russell declares that this explains their contraction on coking. But oxidation and the presence of inerts—fusain or coke breeze—lower agglutinating values and reduce maximum internal gas pressures and expansions in much the same

manner as they appear to be lowered by the splinty Lower Banner coal. Lower Banner coal was not oxidized or mixed with inerts but the splint may have the same effect when in quantity, for Mott and Wheeler have noted that "durain," which is the British synonym for the American word "splint," is a valuable constituent in the coking of slack in concentrations as high as 40 per cent, but, because it lowers the swelling power of a mixture, it may prevent proper agglomeration, if more than 40 per cent be present.

Splint and cannel, concluded Mr. Reynolds, which are the predominant types in Lower Banner coal, modify the plastic properties of that coal so that its coke-making property is unlike that of other medium-volatile coals.

Should Fusain Content Be Counted or Determined Chemically?—In the coal laboratory of the Illinois Geological Survey, the fusain content of coal has been estimated for many years by counting the number of fusain particles with the aid of a microscope, asserted O. W. Rees, chemist and head of the analytical division, Illinois State Geological Survey, for himself, B. C. Parks, assistant geologist of that survey, and G. W. Land, research engineer, Battelle Memorial Institute. This is described as a petrographic analysis. Being tedious, subject to personal errors, and not permitting of determinations being made concurrently, some other technique is highly desirable. An investigation was made, therefore, to determine whether the chemical method described by Dr. W. Fuchs, Pennsylvania State College, would justify its permanent use by providing values for fusain in sufficiently close agreement with those obtained by the petrographic method.

Counted Under Microscope

When this method is used, the sample selected by riffling is weighed and then separated into size classes by screening, usually through twelve Tyler standard sieves ranging from No. 8 mesh to No. 300 mesh, with screen openings decreasing in the ratio of the square root of two. Then, the component particles in each size are manually separated and counted under a binocular microscope designed for ore-dressing studies. With such a count, the fusain percentages by weight are derived by assuming that all particles are spheres of the same size and specific gravity (1.35). Though these assumptions are not exactly true, results so obtained appear to check reasonably well with those obtained by actually weighing the particles separated. An experienced petrographer working carefully could not complete an analysis in much less than a week, and there are no short cuts by which a duplicate count can be made less difficult.

Oxidize Coal With Nitric Acid—In the chemical method, reliance is placed on the relative susceptibility to oxidation of fusain and non-fusain coal material, which procedure consists in oxidizing one-gram portions of minus 200-mesh coal by boiling in 8N nitric acid for two-, three- and four-hour periods respectively. After washing with sodium hydroxide, hydrochloric acid and water, the residues are dried at 105 deg. C. and weighed. Ash values are determined

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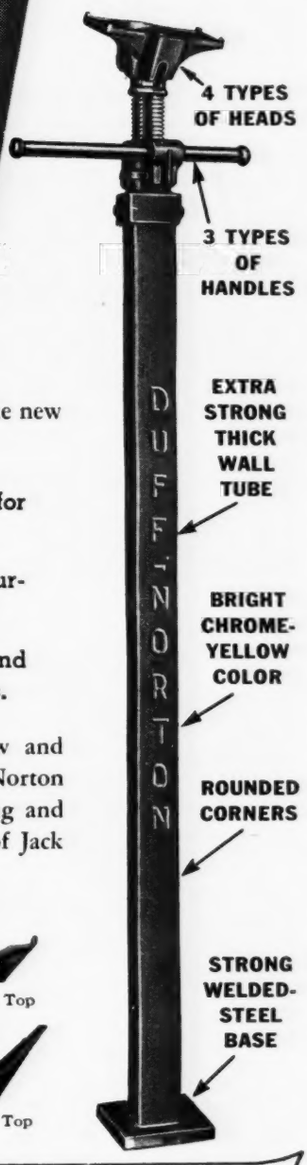

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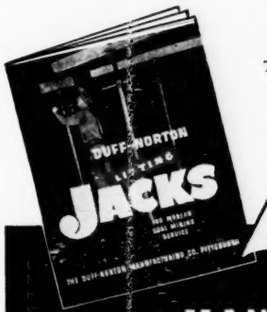

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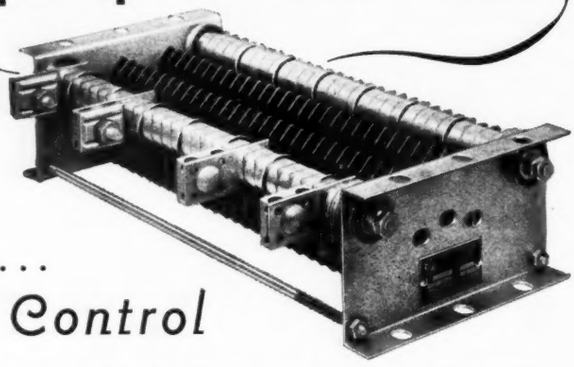

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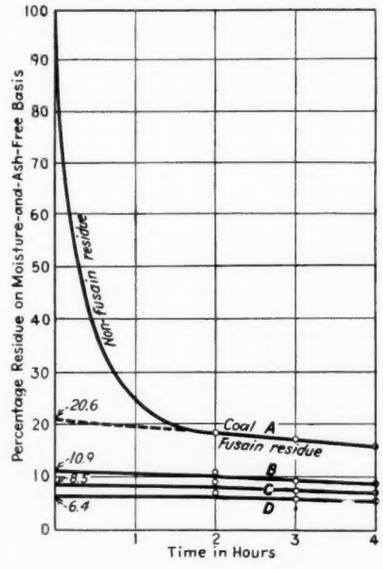
on these residues, and the moisture-and-ash-free residue values are plotted against time. A straight line is drawn through these points or through the two points most remote from the axis if a single line cannot be drawn to pass through all the points. This line is extended to cut the vertical axis, which represents zero time. The corresponding residual value is taken as the fusain value.

The accompanying figure shows typical curves for three of the samples studied, and the extension of the lines to the vertical axis. In the same figure is shown a typical oxidation curve for times from 10 minutes to 4 hours. This appears to be made of two



How percentage of fusain is derived from the oxidation data of the coal as a whole.

parts, the first or curved portion representing the oxidation of the non-fusain coal material and the second or flat portion the oxidation of the fusain.

Hsiao's Method Cuts Time Almost in Four—In only three of the samples did the result obtained by chemical method vary more than 2 per cent from that obtained by the petrographic method. In the other ten samples, the difference varied from 0.02 to 1.8 per cent. Instead of taking five to ten days, as with petrographic methods, the work on each sample was done in two days. Residues from the chemical analyses were examined under the microscope, and only fusain could be found in them. The fusain in these residues was unusually easy to identify.

The petrographic method has its faults because it sometimes is difficult visually to distinguish fusain from attritus, but, on the other hand, with the chemical method, there are forms of attritus that oxidize with difficulty, which attritus accordingly may be misplaced. In Illinois, most of the fusain is of the soft type, but perhaps there is little difference between the soft and the hard material. At least, Dr. Fuchs had found that difference to be inconsiderable.

Dr. Howard remarked that fusain gave chiefly the benzene hexacarboxylic (mellitic) acid, $C_6(COOH)_6$, on oxidation, while

predominantly bright coals yielded a mixture of aromatic acids with three, four or five carboxylic groups attached to the benzene ring. As high yields of mellitic acids are obtained also from cokes and charcoals, it seems probable that fusain at some time in its hectic past had been subjected to higher temperatures than the rest of the coal.

Credit for the chemical method of determining fusain should be given to a Chinese investigator at Pennsylvania State College, A. W. Hsiao (pronounced Shaw), now deceased, said A. W. Gauger, director, Mineral Industries Research, State College. At first, the system was received most unfavorably by some authorities, but it was accepted by investigators in Great Britain as the standard for their work.

Unusually Large Quantities of Calcite and Pyrite Complicate Analysis—Where calcite and pyrite are present in unusual percentages, satisfactory results are difficult to obtain if the American Society for Testing Materials standard procedure is followed, because, with a more rapid heating procedure, indefinite quantities of sulphur will be retained as calcium sulphate, asserted Dr. Rees for himself and W. A. Selvig, supervising chemist, U. S. Bureau of Mines. Slow heating rates will lower the figures obtained for ash and sulphur content.

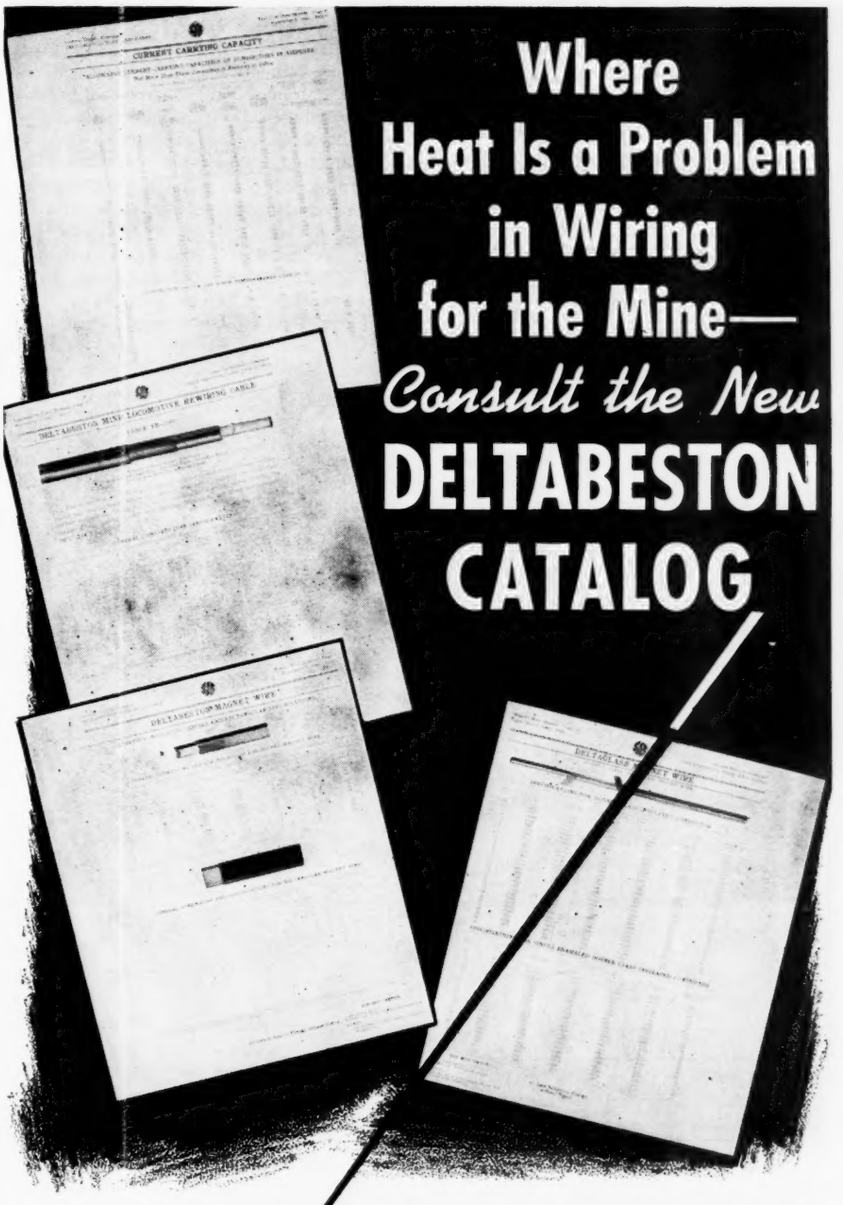
Two Drying Methods Used

The best results were obtained by placing a dried sample in a cold furnace and heating it to 400 deg. C. in a half hour, holding it at that temperature for a further half hour, then transferring it to another furnace at 725 deg. C. and heating it to constant weight. Another method that gives consistent results is to place the sample in a cold furnace and heat it to 725 deg. or 750 deg. C. in 1½ to 2 hours, and maintain that temperature until the weight of the sample becomes constant.

No methods more speedy than these seem to give consistent results. Adequate removal of sulphur trioxide (SO_3) from the furnace in which the coal is reduced to ash is necessary. Parr's sulphated ash method was tried, and it checked reasonably well, but that procedure is rather long and requires mineral carbon-dioxide values for use in correcting the sulphated ash obtained. In fact, the authors say the sulphated-ash method "appears to give good results especially for coals quite high in calcite and pyrite, where other procedures studied were not so satisfactory. But this Parr procedure requires more work than others."

In discussion, Dr. Rees said that the modified procedure is needed where calcite and pyrite are found in quantity. In the East, these difficulties might not occur, but they did occur sometimes in Illinois. If there are carbonates in the coal, if there is uncertainty as to the presence of carbonates, or if satisfactory duplicates cannot be obtained, it is well to follow the technique outlined. The temperature, 725-750 deg. C., was chosen to correspond to the temperature specified by the A.S.T.M. standard procedure.

Sulphur-in-Coal Determinations Speeded—Quoting results of a cooperative study sponsored by A.S.T.M. Committee D-5 of gravimetric and volumetric methods of sul-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phur determination in coal, S. S. Tomkins, Consolidated Edison Co. of New York, stated that aliquots of four samples of coal containing from 0.7 to 3.0 per cent sulphur were distributed to eight nationally known fuel laboratories. The sulphur in the coal was converted into soluble sulphates either by burning the coal in an oyxgen bomb or by fusion with sodium peroxide (Na_2O_2) or with Eschka mixture (two parts magnesium oxide, MgO, plus one part anhydrous sodium carbonate, Na_2CO_3) according to the standard A.S.T.M. methods.

The soluble sulphates were determined gravimetrically by precipitation of barium sulphate followed by ignition and weighing according to the standard method, and also volumetrically, using for internal indicators tetrahydroxyquinone ($C_6H_4O_6$), known as THQ, and sodium rhodizonate ($Na_2C_6O_6$). These compounds dissolve in the sulphate solution and have colors which change sharply at the completion of the titration reaction.

Determination Speedy and Accurate—In all, 380 determinations were made and the test results indicate that the accuracy of these volumetric methods is about the same as the standard A.S.T.M. gravimetric methods, and therefore will give satisfactory results.

The advantage of the volumetric method is a saving in time and labor in laboratories testing a large number of coals. As an example, a laboratory was cited in which seven men are engaged in testing over 100 coals a week with the use of the present A.S.T.M. methods. Substitution of one of these volumetric methods for the present gravimetric sulphur method would permit a reduction of 1 to 1½ men in the staff without any decrease in the accuracy of the sulphur determination.

Shortening Ash-Fusion Tests—Another shortened procedure and one that it is hoped will be gratefully received, because it does not involve exposure of the chemist to the scorching heat of a large furnace, is the so-called micro method for determining the respective temperatures at which ash softens and then becomes fluid. A method for measuring the characteristics of coal ash using only 1 mg. (0.000035 oz.) or less at a time was described by Dr. Gauger, reading the paper of J. A. Taylor, Pennsylvania State College.

Preparing Fusion Samples

Small cylinders of molded ash are made in a capillary glass tube with a fine rod of glass or steel as a plunger. These midget cylinders are mounted on a small plaque of firebrick partly covered with wet alundum cement. They are then heated in a small gas-fired porous-muffle furnace at a rate of 15 to 30 deg. C. per minute and observed through a port in the furnace with a telescope mounted several feet away. The temperature at which the cylinder melts and forms a sphere is designated the micro-softening temperature and the temperature at which this sphere flows over and into the plaque is described as the micro-flow temperature.

With 25 determinations, the average error was plus or minus 19 deg. F. for the micro-softening determination and for the micro-flow determination, plus or minus 37

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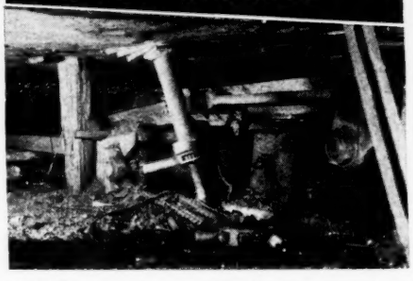

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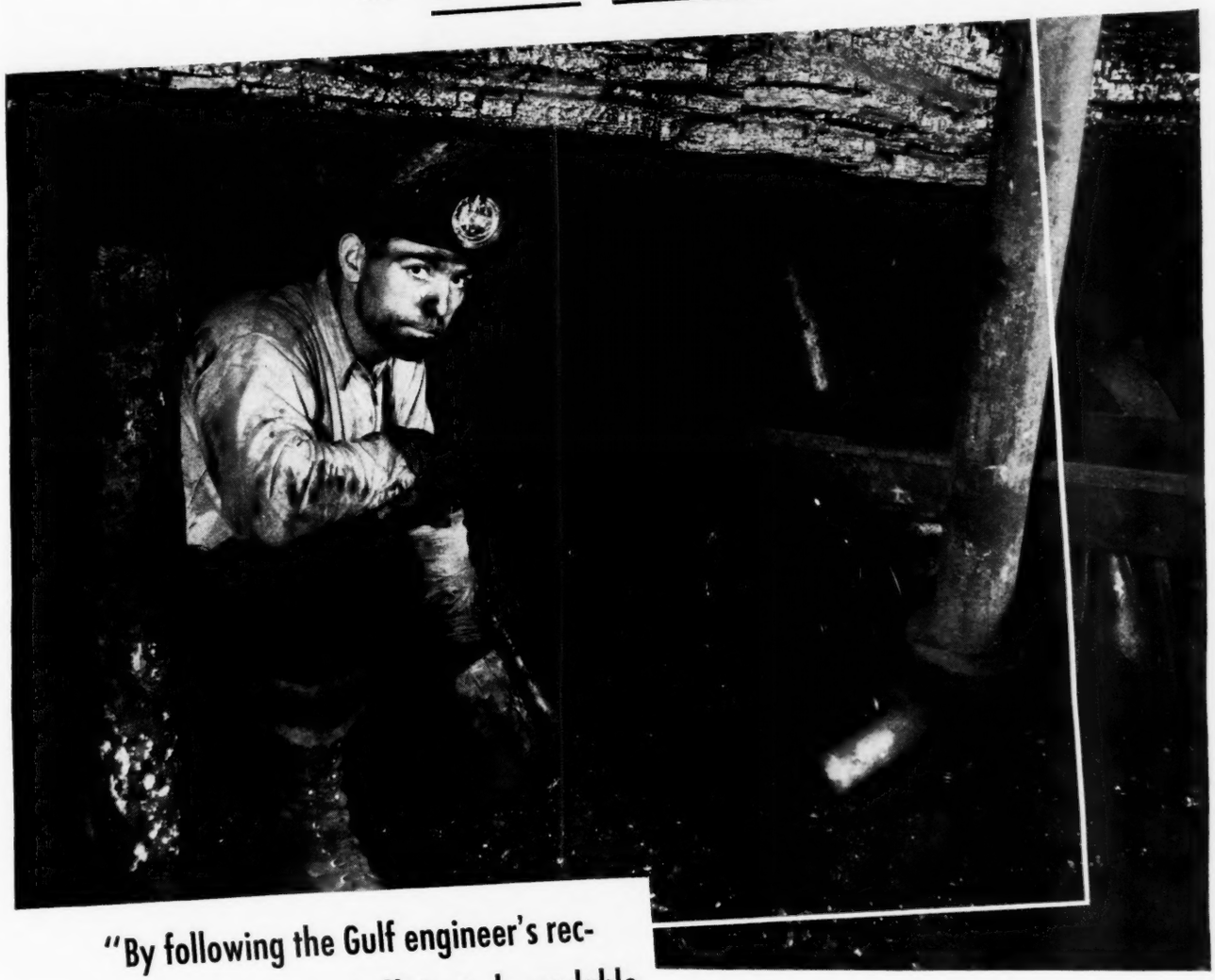

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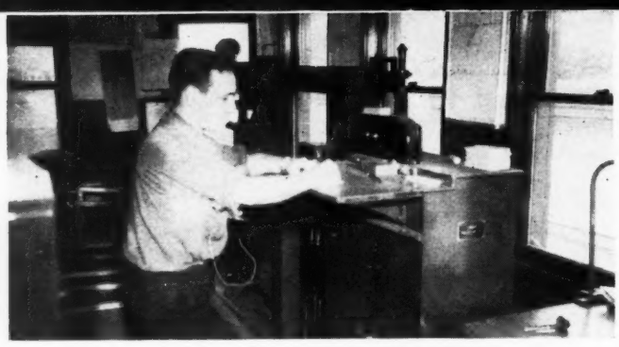

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deg. F., the latter being the more difficult point to determine. Ease of manipulation, rapidity of determination and differentiation between bad and good are points in favor of the micro method. Dr. Gauger said this system would act as a control on product, though the test shows a somewhat different stage from that obtained with the A.S.T.M. method. Using the larger cone sample, there was a lag in the melt.

When Does Coal Ignite?—Some have said that coal ignites when it begins to give out more heat than it receives, but surely, declared J. J. S. Sebastian, Coal Research Laboratory, Carnegie Institute of Technology, the temperature at which it ignites is lower, for at first it burns without generating enough heat to maintain combustion, and this is distinctly prior to the stage when it gives out enough heat that its combustion is self-sustaining. Another definition of the latter stage is the point of time when the fuel is at the same temperature as the furnace and about to exceed that temperature, or, as it has been termed, the "crossing point", T_c.

Factors Modifying Reactivity

This ability to react to oxygen is known as the reactivity of the fuel, but there are other factors which modify the effect of reactivity: Coking property, size and size distribution (on which depend the resistance to air flow through the fuel bed), and also the quantity of coal surface exposed to the air, decrepitation due to heat, ash content and characteristics, and moisture content which influences extent of packing. So in practice T_c is not a constant for any given fuel or even size of fuel.

Is Already Burning When Coal and Furnace Are at Same Temperature—The procedure in the Coal Research Laboratory is to heat the coal or coke sample at a predetermined rate in air, oyxgen or any known mixture of oxygen and nitrogen and to determine the point at which the temperature of the furnace and of the sample coincide, and also the rate of rise of the sample temperature $dT \div dt$ at the moment of coincidence. From the data obtained, the temperatures at which the reaction between fuel and oxidizing gas proceed at definite rates can be calculated.

A different temperature is found for the crossing point, depending on the rate of increase of temperature per minute: T_{15} where the rate of increase is 15 deg. C. per minute, and T_{75} when the rate is 75 deg. C. per minute. Both these rates are used for comparing the reactivities of various fuels. The lower are these reactivity indexes, the more reactive is the fuel. For the coals tested, the reactivity index, T_{75}, ranges from about 220 to about 300 deg. C., and with cokes from about 250 to about 570 deg. C. The low-temperature cokes occupy the lower values of the coke index. Normal commercial high-temperature cokes have indexes ranging from about 500 to 570 deg. C.

Changes Effected Make Results More Accurate—Improvements made in the apparatus include: Pushing of thermocouple wires through grooves cut into furnace block alongside each glass tube and bringing their welded joints into contact with the outer walls of the glass tubes; replacing cast-iron core with rolled-copper core with

its higher heat conductivity and lower specific heat; using freshly welded thermocouple joints subjected to a heat treatment for 5 to 6 hours prior to calibration (as the electromotive force is constant only after some use) and flushing the apparatus with nitrogen as soon as the flow of oxidizing gas is shut out from the chromel-alumel thermocouples (for, in presence of rich concentrations of carbon monoxide, these thermocouples rapidly deterioriate). No clear-cut relationship exists between volatile matter and reactivity, even with coals from the same seam, though, within very wide limits, the higher-volatile, or lower-rank, coals ignite at a lower temperature than the higher-rank lower-volatile coals.

Ways of Measuring Oxidation of Coal—Degree of oxidation by weathering has been studied in three ways: (1) The reduced rate of reaction as the process proceeds; (2) development of acidic groups growing strong sorptive properties for heavy metal ions or for water, and (3) the changes in plastic properties of coal on carbonization or in character and quantity of decomposition products, asserted John Radspinner, graduate student, Coal Research Laboratory, Carnegie Institute of Technology.

Determining Oxidation

To determine oxidation in mols of oxygen per gram of coal, oxidation was hastened by using an atmosphere of oyxgen and temperatures of 100 to 125 deg. C. The logarithm of the cubic centimeters of oyxgen consumed per 100 grams of coal was plotted against the logarithm of the time of oxidation in hours. The relationship gave a nearly straight line and the slope was 0.75, the same for all three coals tested—Pocahontas, Pittsburgh and Illinois. In the first stages of a run the oxygen is largely fixed on the surface in some complex C_xO_y and, as the surface is blanketed with the product, the loss of available space causes a reduction in the reaction rate. However, as oxidation proceeds, the complexes split off either spontaneously or through further oxidation, giving water, carbon dioxide and carbon monoxide.

Use of liquid oxidants for measuring the rate of reaction would be more convenient, but the results using alkaline permanganate were poorly reproducible and showed no significant difference in rates of reaction between raw and roasted coals. Acid permanganate showed a difference between these coals, the latter being less reactive, but the values again were not reproducible. Restricting the sample to sizes between 40- and 60-mesh greatly improved reproducibility. Because of its stability and the ease with which the excess reagent could be determined, chromic acid was preferred to acid permanganate.

Liking for Water, Oxidizing Properties and Decomposition Products as Indexes—Another way of determining the degree of oxidation is by the ease with which oxidized coal is wetted; oxidized coal surfaces have marked hygroscopic properties. Also Yohe and Harman showed that a surface of freshly oxidized coal has definite oxidizing properties which could be measured with titanous chloride and such a test could be used for measuring surface oxidation in its early stages. Still another way depends on the effect of oxidation upon the products of decomposition of the whole coal or the oxide film. Authorities in England and here have found that tar yield decreases regularly with oxidation and that yield of carbon dioxide in the gas increases with the same condition. Quantity and quality of coke, and plastic properties, though they vary with oxidation, do not appear to be sensitive enough to be indexes for oxidation.

At both morning and afternoon sessions, H. C. Howard, chairman of the division, presided. Chairman of the division for the coming year will be O. W. Rees; secretary, G. R. Yohe, associate chemist, Fuels Division, Illinois State Geological Survey; vice chairman, Gilbert Thiessen, assistant to director of research, tar and chemical division, Koppers Co., with Dr. Howard a fourth member of the executive committee.

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Preston County Institute Emulates Quiz Kids

Presenting a quiz program patterned after that of the Quiz Kids of radio fame, the Preston County Coal Mining Institute met Sept. 24 at Coketon, W. Va. Messrs. Ankeny and Westfield, of the U. S. Bureau of Mines, conducted the quiz with questions taken from the West Virginia Mine Foreman Examination Guide for 1940. The judges were Clyde Rowe, mine inspector for the State of Maryland; Joseph Bierer, district mine inspector for West Virginia, and Henry Harrison, Cum-

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PREMIUM Stoker Coal

Erecting a "Pennsylvania" BRADMILL for preparing PREMIUM Stoker coal

Tests made in 3 different types, leading to selection of equipment for preparing 1¼"x⅛" Domestic Stoker coal, indicated approx. 22%, and 16% minus ⅛" from two types, with varying amounts of oversize, while the BRADMILL test showed less than 9% ⅛" and *no* oversize.

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ROCK ISLAND ILLINOIS

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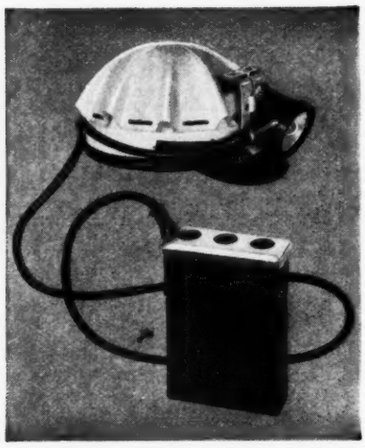


POWHATAN MINE *uses* Portable's Cap Lamps

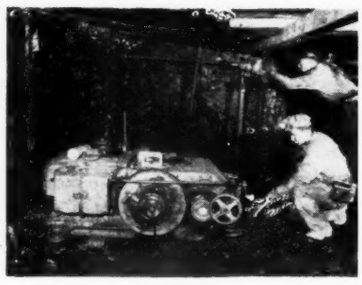
Operators of the Powhatan Mine, producer of 7,000 tons of coal daily, know they must have light they can depend on. They know they need cap lamps that supply *undiminishing* light hour after hour, shift after shift. That's why they have installed 700 Portable Cap Lamps.

Unlike some lamps, Portable's supply just as much light year after year as they do the first day they are installed. The PORTABLE LEAD ACID BATTERY is *guaranteed* never to be less than 80% of new efficiency; the PORTABLE CONTRACT, renewable annually, *guarantees* that light volume will remain constant.

Take a tip from the Model Mines . . . make sure your men have all the light they need—all the time. Write for complete details of Portable's Cap Lamps.

ALL THESE MODEL MINES USE PORTABLE'S CAP LAMPS
Powhatan Mine, Witch Hazel Mine, Camel Run Mine

Lamphouse of the Powhatan Mine, Powhatan Point, Ohio, showing some of the 700 Portable Lamps in charging racks. Construction of these racks permits "self-service", saves lamphouse labor.



The fact that Powhatan Mine is completely mechanized means that steady light is extra important. These Powhatan men always get adequate light from their Portable Cap Lamps

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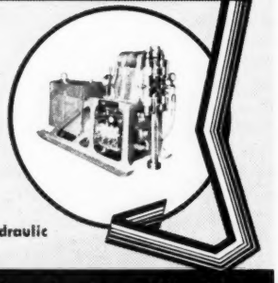

Inside Mine Drilling
•
Pre-Grouting for Mine Shafts. Solidification of Wet Mine Areas
•
Wells and Discharge Holes Drilled and Grouted

Light Gasoline Drills Save Fuel and Moving Cost
•
1200'—2¼" Core-Oil Hydraulic

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berland Coal Co. A. F. Diamond, president of the institute, commented on the value of this type of program for local safety meetings as well as institute gatherings. About 100 members were present.

These officers were elected: Paul E. McKinney, president; J. F. Foreman, secretary-treasurer; N. W. Montgomery, S. B. Jeffries, F. W. Cupp, A. L. Helmic, A. F. Diamond, N. P. Reidler, Harold Ream, Clyde Howe and Joseph Bierer, vice presidents.

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Obituary

GEORGE V. O'HARA, 63, assistant to the general manager of the Glen Alden Coal Co. and widely known in the anthracite region, died Sept. 13 in the Moses Taylor Hospital, Scranton, Pa., of a heart attack. He began his mining career with the Pennsylvania Coal Co., becoming affiliated with the Glen Alden company 26 years ago. He served for a time as superintendent at the old Pettebone colliery, later assuming a similar position at the Storrs colliery. From the latter he was advanced to general manager of Glen Alden's northern division, with supervision over Loomis, Woodward, Lance, Nottingham, Buttonwood and Avondale collieries, which he held until last year.

WILLIAM EDWARD WHITTON, 54, for the last 20 years master mechanic at the Sayreton mines of the Republic Steel Corporation, died Aug. 28 of a heart attack at his Sayreton (Ala.) home.

HOMER P. CHANDLER, 63, long affiliated with the Ohio Brass Co. as development engineer of the mining department, died Sept. 2 after a brief illness. Going to Mansfield, Ohio, in 1921 from Pulaski, W. Va., where he was chief engineer of mines and furnaces for the Pulaski Iron Co., he played an important part in the development of the O-B mining department during later years. A native of Columbus, Ohio, Mr. Chandler was first employed by the Jeffrey Mfg. Co., later becoming electrician at the Reading Iron Co. mine, Stoyestown, Pa., before going to Pulaski.

Homer P. Chandler

Clarence J. Sandoe

CLARENCE J. SANDOE, formerly vice president of the Perry Coal Co., operating in Macoupin and St. Clair counties, Illinois, and member of District 10 Producers' Board, died Aug. 29 after a long illness. He was widely known in the coal industry of the Middle West.

JAMES MCGINLEY, mine foreman at Exeter colliery of the Payne Coal Co., Pittston, Pa., died Aug. 25 at his home in Exeter after several months' illness. At one time he was inside foreman with the Jermyn Coal Co. and also had been in the coal mining business with his brother, the late John McGinley.

FRANK E. HOUSTON, 45, former superintendent of mines for the Houston coal interests, which included Carswell, Keystone and Maitland mines in McDowell County, West Virginia, died Sept. 17 at Huntington, W. Va., in a hospital to which he had been admitted as a patient prior to an operation.

•

Coal-Mine Accident Fatality Rate Ebbs for Soft; Up for Hard

Accidents at coal mines of the United States caused the deaths of 84 bituminous and 14 anthracite miners in July last, according to reports furnished the U. S. Bureau of Mines by State mine inspectors. With a production of 43,300,000 net tons, the accident death rate among bituminous miners was 1.94 per million tons, compared with 4.15 in July, 1940.

The anthracite fatality rate from accidents in July last was 3.03, based on an output of 4,623,000 net tons, against 1.54 in the corresponding month a year previous.

For the two industries combined, the accident fatality rate in July last was 2.04, compared with 3.86 in the seventh month of last year.

Fatalities during July last, by causes and states, as well as comparable rates for the first seven months of 1940 and 1941, are shown below.

UNITED STATES COAL-MINE FATALITIES IN JULY, 1941, BY CAUSES AND STATES

State	Underground: Falls of Roof	Haulage	Gas or Dust Explosion	Explosives	Electricity	Machinery	Mine Fires	Other Causes	Total Underground	Open-cut	Surface	Grand total
Alabama	2	..	11	..	..	..	..	..	13	..	..	13
Colorado	1	1	..	..	..	..	..	..	2	..	..	2
Illinois	3	..	..	1	..	..	..	..	4	..	..	4
Kansas	2	..	..	..	..	..	..	..	2	..	..	2
Kentucky	5	2	..	..	..	1	..	..	8	..	..	8
Missouri	..	..	..	..	..	..	..	1	1	..	..	1
Ohio	2	1	..	..	..	..	1	..	4	1	..	5
Oklahoma	..	..	2	..	..	..	..	..	2	..	..	2
Penna. (bituminous)	6	4	..	1	..	..	..	..	11	..	..	11
Tennessee	1	..	..	..	..	..	..	..	1	..	..	1
Utah	1	..	..	..	..	..	..	..	1	..	..	1
Virginia	3	..	..	..	..	..	..	1	4	..	..	4
West Virginia	15	10	..	..	2	..	..	..	27	..	3	30
Total bituminous	41	18	13	2	2	1	1	2	80	1	3	84
Pennsylvania (anthracite)	9	2	..	2	..	..	..	..	13	..	1	14
Grand total	50	20	13	4	2	1	1	2	93	1	4	98

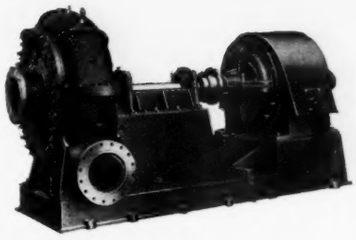
DEATHS AND FATALITY RATES AT UNITED STATES COAL MINES, BY CAUSES*

	January-July, 1940 and 1941											
	Bituminous: Number Killed		Bituminous: Killed per Million Tons		Anthracite: Number Killed		Anthracite: Killed per Million Tons		Total: Number Killed		Total: Killed per Million Tons	
Cause	1940	1941	1940	1941	1940	1941	1940	1941	1940	1941	1940	1941
Underground:												
Falls of roof and coal	318	277	1.245	1.029	60	60	1.983	1.962	378	337	1.323	1.124
Haulage	117	98	.458	.364	24	15	.793	.491	141	113	.494	.377
Gas or dust explosions:												
Local	9	13	.035	.048	2	5	.066	.164	11	18	.038	.060
Major	226	42	.885	.156	..	..	....	....	226	42	.791	.140
Explosives	14	12	.055	.045	5	7	.165	.229	19	19	.066	.064
Electricity	18	10	.070	.037	5	2	.165	.065	23	12	.081	.040
Machinery	17	17	.067	.063	1	...	.033	.....	18	17	.063	.057
Shaft	3	2	.012	.008	3	2	.099	.065	6	4	.021	.013
Miscellaneous	19	6	.074	.022	3	7	.099	.229	22	13	.077	.043
Stripping or open-cut	6	14	.023	.052	2	2	.066	.065	8	16	.028	.053
Surface	25	19	.098	.070	5	8	.165	.262	30	27	.105	.090
Grand total	772	510	3.022	1.894	110	108	3.635	3.532	882	618	3.087	2.061

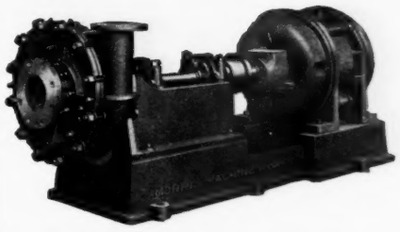
* All figures subject to change.

The MORRIS HYDRAULIC COLUMN

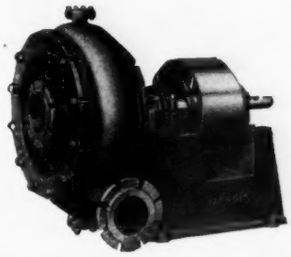
News of interest to Centrifugal Pump Users



WITH TWELVE different designs of abrasive-handling pumps in the Morris Centrifugal Pump line, you are sure of an exactly suitable selection for all your coal mine requirements.



THESE MORRIS DESIGNS range from a simple, low-cost sand pump with only three wearing parts, to high-head alloy-steel lined abrasive-handling pumps which have proven their wear-resisting and long-lasting qualities on the severest service.



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MEMBER

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Arc-Welding Used in Erection Of New Harmony Plant

Now under construction, the new Harmony mine, Linton-Summit Coal Co., four miles east of Sullivan, Ind., is to have a welded tipple supplemented by a welded settling cone, now completed. The washery building, however, is being fabricated by arc-welding, using Harnischfeger PF electrodes. The washery equipment is McNally-Norton. This is at least the fifth coal preparation structure in this section of Indiana to be fabricated by arc-welding.

The motor-generator set for underground power is located in a walled-off room in the shop. This brick shop building with concrete floor houses the machine and forging tools for the maintenance of the plant. Electric wiring for these tools is laid under the floor in conduit. Control devices are attached to the tools or mounted on the wall near by.

•

Black Gold Coal Co. Formed

James McSherry, head of the Illinois Department of Mines and Minerals in the administration of Governor Horner, together with several DuQuoin (Ill.) associates, has organized the Black Gold Coal Co. The new plant adjoins the property once operated by the Perfection Coal Co. A railroad track has been extended to the tipple site. Work has been started on the slope, which is expected to reach coal early in October. The 8-ft. seam, 65 ft. below the surface, will be worked by modern methods and brought to the surface on a belt. Capacity is to be 2,000 tons daily.

•

Chafin Sells Mining Interest

Don Chafin, former sheriff of Logan County, West Virginia, has sold his interest in the Chafin, Jones & Heatherman mining operations at Peach Creek for about $250,000 and has retired from the coal-producing field, he announced on Sept. 4. The sale was made to the other members of the firm, Dr. K. J. Heatherman, who will continue as president and general manager, and Mrs. W. T. Jones. Mr. Chafin still has extensive undeveloped coal acreages in the Logan field.

•

Mine "A" Lease Sold

Lease of Mine "A" of the Central Illinois Coal Co., Springfield, Ill., has been sold to Carl H. Elshoff, president, Mine "B" Coal Co., according to an announcement Sept. 4 by William M. Ryan, president of the former company. The plant has been closed since April 1. It was one of the few in that area employing Progressive Mine Workers. The rival United Mine Workers obtained the right to work the Mine "B" plant several months ago following a lengthy dispute.

Workers at Mine "A" voted Sept. 14 to change their allegiance from the Progressives to the U.M.W., whereupon the new owner signed a new contract and announced that the property would be reopened immediately.

Illinois Mine Commission Members Appointed

Members of the Strip-Mining Investigating Commission and of the Mine Investigation Committee, four new members of the Miners Examining Board and two State mine inspectors were named Sept. 4 by Robert M. Medill, State Director of Mines and Minerals of Illinois.

Named to the Mine Investigation Commission were Thomas Greenan, Springfield; Fred Pfahler and A. H. Truax, Chicago, representing the Coal Operators' Associations; Ben Kuntz, Mount Olive; Voltaire Jouglett, Stonington, and Richard McAllister, DuQuoin, representing miners' organizations; and Don Baldwin, Belleville; E. A. Powers, Peoria, and Robert Schott, Quincy, representing the public. Anna Kain, Springfield, is secretary of the commission.

Appointees to the Strip Mining Commission are Harold Hicks, Belleville, for the producers' association; Hubert E. Howard, for the Illinois Coal Operators' Association, and Al Preussing, Belleville, and Charles Brusch, representing the miners. Legislative members had previously been appointed.

New members of the mining examining board are Joe Boetta, Gillespie, and Joseph Turner, East St. Louis, for the Progressive Mine Workers, and Lloyd Owens, Orchard mines, and Jack Knowles, West Frankfort, for the United Mine Workers.

John Golden, DuQuoin, was appointed mine inspector in District 9 and Roy McCluskey, for District 12.

Three State senators already named as members of the strip-mining commission are: John Speakman, Danville; Elmer Droste, Mount Olive, and George Maypole, Chicago.

•

Increases Power Production

Because of increased power demand, the Consol Power Co., Mount Olive, Ill., which supplies power to the Consolidated Coal Co. mines in that vicinity, is substituting a 2,500-kw. Allis-Chalmers turbine for a 1,000-kw. Westinghouse unit in use since the power plant was built. The new unit was acquired from the Standard Oil Co.'s Carlinville (Ill.) power plant. Interesting is the fact that by rewinding for 2,300 volts instead of the original 6,600 volts, enough copper has been added to increase the capacity to 3,100 kw., the steam end being large enough to carry that load.

•

Plan New Somerset Operation

Nearly 5,000 acres of coal land has been acquired in Somerset County, Pennsylvania, by the Cambria Fuel Co., which will develop it. About 4,000 acres was leased from the Wilmore Coal Co., a Berwind-White subsidiary, located west of Shanksville in Stonycreek and Somerset townships; 3,900 acres of this is underlaid with the D seam and all with the C Prime and B seams. About 800 acres also has been obtained for necessary buildings, tipple and railroad tracks.

C. C. Dovey, of Johnstown, is president of the company, and P. H. Tuttle, president of the Wilmore Coal Co. and vice president of the Cortright Coal Co., also will be identified with Cambria, having charge of distribution of the associated organizations. J. Lewis Evans is general superintendent.

Officials of the company said the first opening will develop a mine of 3,000 tons' daily capacity, to be followed by two additional mines of 1,500 tons' capacity each daily. The Baltimore & Ohio R. R. already has begun work on construction of a line to the property 8.3 miles long.

•

To Start New Stripping

Tasa Coal Co., through its subsidiary, the Shirley Gas Coal Corporation, is opening a new strip operation on about 300 acres of land at Mahood, Clay Township, Butler County, Pa. Situated on the Western Allegheny R.R., the operation is expected to be in production early in November. Operation will be in the Summit seam, running from 4 to 6 ft. thick.

•

Stover Forms New Smokeless Firm

Stover Smokeless Coal Co. of West Virginia has been organized by Holly Stover, P. C. Graney, Tom and Ronald Snyder, A. Erskine Miller and Hugh Sproul Jr., and will operate the Stonewall mine in Raleigh County near Stanaford. Mr. Stover will be president of the new organization. With this operation the Stover group will have six mines in the Beckley-Fire Creek area.

For Lower Power and Replacement Costs

•

POWHATAN MINE uses

MESCO WELDING MACHINE in use underground at Powhatan Mine. These money-saving machines are available in two sizes, for use with 250-300 or 500-600 D.C. current.

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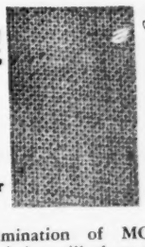

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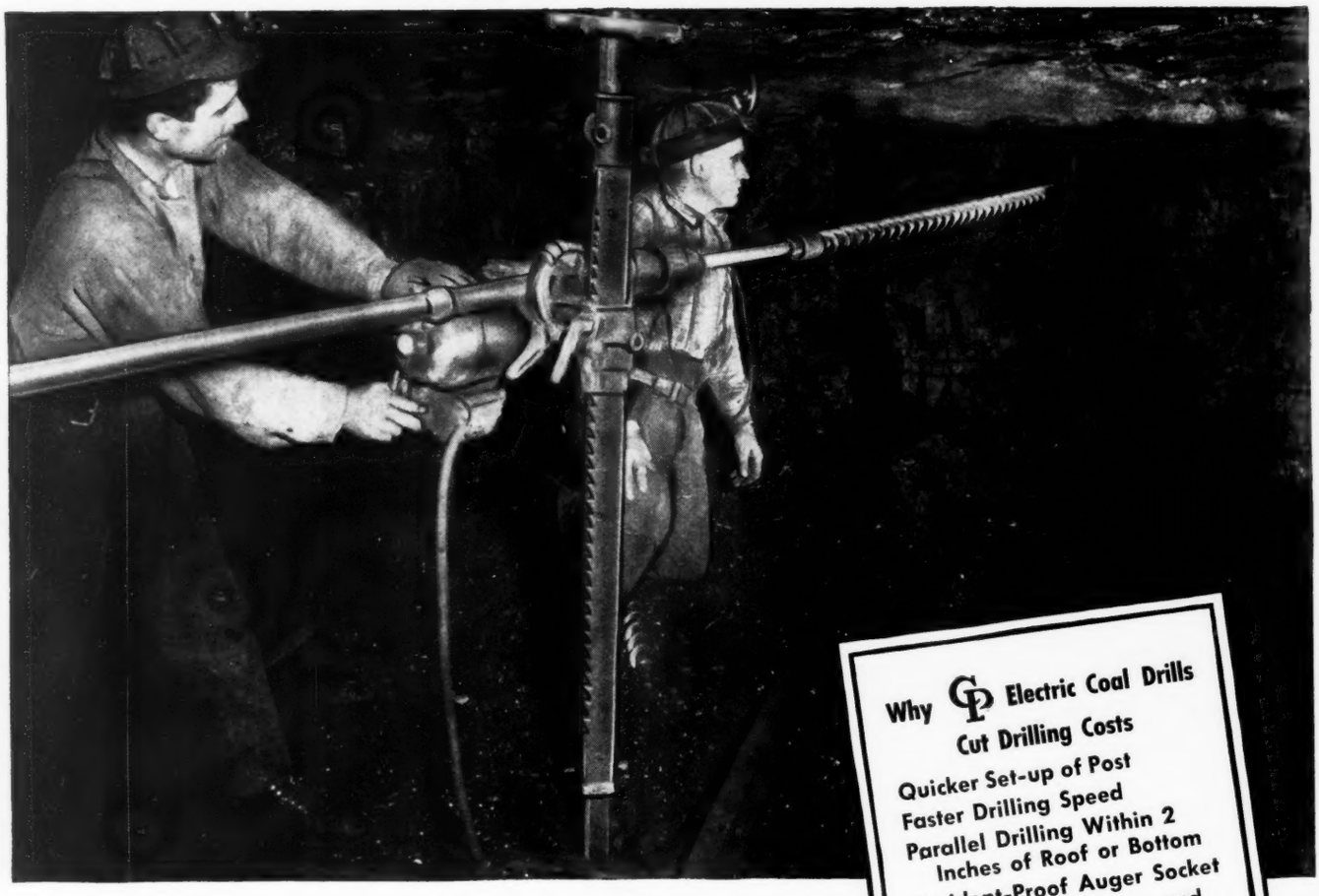

Depth of drilling, 9 feet; time of drilling, 3½ minutes; five holes drilled per place and nine places (22 feet wide) per shift, is the performance of CP Electric Coal Drills in Dun Glen No. 11 Mine of the Hanna Coal Company, Dun Glen, Ohio.

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